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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Dairying in Australia—Queensland's Prominence.

"QUEENSLAND produces one-fourth of the butter and one-half of the cheese manufactured within the Commonwealth," said Mr. E. Graham, Under Secretary for Agriculture and Stock, in the course of a notable address at a gathering of representatives of the dairying interests of Australia, at Brisbane on 19th October. Stressing the importance of dairying in our national economy he showed that there are, in all, 149,000 persons engaged directly in the industry in Australia. Their production of butter alone aggregates 340,000,000 pounds per annum, of which 145,000,000 pounds finds a quittance in overseas markets. The value of the industry to the Commonwealth is £32,140,000 per annum, and the capital expended in buildings and plant totals £3,500,000.

Continuing, Mr. Graham said that the dairying industry was well organised in comparison with other sections of the primary production, and this was largely due to the brains and energy of the men present at that gathering. To them the dairying industry owed a deep debt of gratitude. The members of the three boards were not well paid for their services, but they had the satisfaction of knowing that they were accomplishing valuable work of a truly national character. The organisation for which they were responsible was exerting a very great influence on the industry.

It was not only the man who milked the cow who was responsible for the advance in the industry; the butter manufacturer had played an important part, too. The good butter maker was the man who did not spoil good cream in making butter. That showed how important was the work of the manufacturer. In order to compete on a sounder footing against the great dairying countries of the world, it was necessary, he said, for them to strive towards a greater production of butter-fat per cow.

In some countries the average production of butter-fat was considerably higher than in Australia. He realised that the responsibility for an increase of the average rested in a large degree with individual owners of dairy herds. Until they tried to bring about a general improvement in production they would not make much progress in the industry. In Queensland herd-testing was performed without cost to the owners, and he advised them to concentrate on this means of reaching to higher average production.

Farming and Grazing—Their Inter-dependence.

ACCORDING to the Annual Report of the Department of Agriculture, seasonal conditions in the course of the year served to demonstrate more strongly the inter-dependence of the agricultural and pastoral industries of Queensland. The failure once again of the normal wet season in certain of the pastoral areas created an extraordinary demand for farm produce as stock foods, both in bulk and concentrated form. High prices for fodders were the rule, and these, in the circumstances, often far exceeded their true economic value. Graziers in the dry country were faced with the necessity of keeping their stock alive at almost any cost, and this had naturally an important influence on the farming industry. A corollary of this condition and its possible cyclical recurrence is that, in districts suited to agricultural development by modern methods of cultivation, more land will be brought into production and cropped primarily for stock foods.

The dependence of districts of low annual rainfall and restricted water resources on more favoured regions for fodder supplies in dry times became more and more evident in the course of the year. This fact must influence largely agricultural development along the lines of fodder production and conservation, and become no inconsiderable factor in the extension of land settlement in the State.

An example of this inter-relationship of our more important rural industries was provided in the North, where the bulk of the season's maize yield, which approached the million-bushel mark, went to relieve the shortage of sheep feed in the Central-Western areas. The maizegrower experienced the satisfaction of a settled and insistent demand for his grain.

Cotton Growing in Queensland—An Adaptable Crop.

THE cotton grower, in the course of the year, according to the annual Departmental review, met with the most extreme combination of climatic conditions that he has experienced since the revival of the industry in Queensland in 1919. The lightness of winter rains generally made field work both difficult and expensive. Dry conditions continued until the end of September, when light to medium rains occurred over most of the cotton sections. From then on there was practically no more rain until mid-December when precipitations were bountiful and general over the cotton belt. January rainfalls were heavy, amounting to as much as 15 inches for the month in some of the sections. Mid-February was hot and dry, but March was marked with copious rains over nearly the whole of the cotton areas. Later precipitations were lighter. It is obvious, then, that cotton-growing was subjected to a fairly severe test as to its cultivable suitability in inland regions in a wet season.

Results indicate, as a whole, that cotton can be grown with profit in these areas under heavy rainfall conditions.

Experiments and results over the previous five years demonstrated thoroughly the value of cotton as a dry-weather crop. The experiences of the past season indicate certainly that good yields may also be obtained when unusually wet weather rules at critical stages of crop development. It has been shown that the cotton plant will yield well over a series of seasons in the main regions selected for its cultivation in Queensland. It requires but the careful observation of demonstrated methods of cultivation to make cotton-growing a profitable enterprise, bearing favourable comparison with other forms of agriculture conducted in what is called the cotton belt.

The Cold Logic of Economical Conditions.

GENERAL conditions of agriculture are reviewed briefly in the Report. The hard, cold logic of economic conditions, it says, is proving a powerful stimulant to more intensive and extensive co-operative effort. Its general practical application calls for the guidance of leaders of first-rate business acumen. The interests of primary industry call, too, for the abandonment of barren debate (which are, after all, often based upon mere abstractions), and concentration on the application of the principles of better business. This has been done in the sugar industry, the practical economies of which have become the concern of everyone engaged in it and who are benefited by its stabilisation, progress, and profits.

The Stability of Agriculture.

WE have to regard agriculture allied with animal husbandary as a well-rooted industry (continues the Report), and not as a hand-to-mouth, year-to-year proposition. That suggests the need for the wider adoption of the longer view that leads to the creation of a proper perspective of the economics and general conditions of rural industry, and relieves us from alternating periods of undue elation and undue depression.

From past experience we know that, on the average over a term of years, conditions in Queensland are distinctly favourable to further development, in a vast degree, of our great and extending primary enterprises. In Queensland good farming, though perhaps not spectacularly profitable, is a safe and sound business.

Advertisement of Adversity—"Bad Business."

THE Report continues: When agriculture meets with economic difficulties through seasonal adversity, or other causes, all the world is told about it; but when other businesses are under the weather financially every effort is made to suppress the fact. Wide advertisement of adversity is, in every calling but farming, regarded as bad business. This psychological contrast, if it can be so termed, leads often to an overestimation of commercial prosperity and agricultural depression. Taking the longer view, and contrasting it with other callings in which financial mortality is often high in comparison, we come to a clearer appreciation of agriculture as a commercial undertaking.

The Journal.

A STRONGER popular appeal and a substantially increasing circulation among farmers were particularly notable features of the year's progress of the "Queensland Agricultural Journal" (says the Report). As a publication dealing with the principles and practice of agriculture, both technically and scientifically, it is proving of definite value and is appreciated accordingly. It is accepted as an authority on matters relating to the industry it serves efficiently, not only in Queensland but in other States of the Commonwealth and countries oversea. As a medium for disseminating information of educational and economic importance and working field notes it is highly valued. Officers of the Department engaged in directive and specialised work have been generous in their contributions in regard to their frequency, regularity, and practical value, and their material assistance has enabled the Journal to maintain its high reputation as a useful and authoritative publication.

An Agricultural Survey.

THE agricultural survey of Queensland, which is being made with the object of ascertaining definitely and comprehensively, among other things, the character, location, and extent of the various types of soils throughout the State, will take some years to complete, but the Minister for Agriculture and Stock, Mr. W. Forgan Smith, informed the Press recently that the information which, from time to time, was obtained would be available for practical application.

Mr. Forgan Smith said that, in addition to the study of soils, information was being obtained as to climatic conditions, rainfall, temperatures, present vegetation, insect life, and facilities for marketing produce in the districts under review.

The committee first met in February, and on 20th April four field officers—an agricultural instructor, an agricultural chemist with knowledge of geology, a botanist, and an entomologist—set out on a preliminary survey, commencing in the neighbourhood of Flaggy Rock Creek, which was 66 miles south of Mackay, and covering the ground on the coastal side of the range as far as Sarina and the Bolingbroke country on the Connors Range.

Preliminary reports were submitted, and at present the Agricultural Chemist, in company with an officer with a knowledge of surveying, was making a more detailed survey of the Bolingbroke country on the western slopes of the Connors Range.

It was recognised that it would be some years before this survey of the State was completed, but from time to time, as definie information became available, it was thought that much of the agricultural produce now imported could be grown within the State as a result of the knowledge so obtained. There certainly would be on record more definite and accurate information relative to the agricultural possibilities and the future prospects of development of the State.

Bureau of Sugar Experiment Stations.

UBA CANE.

By NORMAN BENNETT, Travelling Scholar.

The Director of the Bureau, Mr. H. T. Easterby, has received the following report on Uba Cane from Mr. Norman Bennett, the Travelling Sugar Technology Scholar:—

Report on Uba Cane—Milling and Payment.

To date, the growing of Uba cane has been confined to those countries where the search for better varieties has been unsuccessful—e.g., South Africa—or in those countries where the existing varieties have been subjected to severe attacks of Mosaic disease, and Porto Rico.

The resistability of Uba cane to Mosaic disease is well recognised, and due to this one property the planting of other canes has been entirely prohibited in South Africa. In Porto Rico and in some of the West Indian Islands, Uba cane was introduced to check the spread of Mosaic disease, but recently the acreage of Uba planted has been reduced, due to introduction of other varieties less resistant to Mosaic but more suitable as regards sugar content and milling conditions than Uba.

The milling of Uba cane has always been attended by considerable difficulty due to the very high fibre content, and also to the high ratio between hard, tough rind and soft pith. Owing to the high fibre tonnage ratio, mill settings have to be widened and extra power (as high as 25 per cent. over softer fibred varieties) is required at the milling station proper so that creditable extraction figures can be maintained. The treatment of Uba cane in a mill set to grind normal canes would result in decreased tonnage and decreased extraction.

Consequently, for best results, it would be preferable to set aside a particular period of the grinding season for the treatment of this cane in order that the mill engineer could adjust his mills to the new conditions and maintain these adjustments during the period of Uba grinding. I am fully aware of the difficulties which would thus arise, but am of the opinion that this is the only efficient method when considerable tonnage of the cane has to be treated.

Under normal conditions in those countries treating Uba cane, the milling equipment consists of some type of crusher or combination of ordinary crusher followed by a shredding device. For the treatment of such hard-fibred varieties as Uba, such a preparatory equipment is essential for obtaining results.

The Cane under Queensland Conditions.

Under Queensland conditions, the milling of Uba cane would be handicapped owing to the following factors:—*Firstly*: It is almost an impossibility, under present conditions, to have cane cut for delivery to the mill in trashless condition. With such a cane as Uba, which retains its leaf sheath firmly, cane delivered to the mill would contain an additional fibre content adversely affecting milling results. *Secondly*: The usual type of shredding device used in Queensland mills is better adapted to the softer-fibred varieties of cane, such as Badila and Goru. Where the rind of the cane is hard and tough, this type of shredder (as I saw it working in Java on B. 247) has no definite shredding action; the results are more like those of tearing the cane into long strips entirely unsuited to the maceration bath system used subsequently in Queensland conditions of milling.

This type of shredder was abandoned in Cuba due to incessant belt trouble when dealing with the hard-rinded Crystallina.

In addition to milling problems introduced in treating Uba cane, further difficulty arises owing to the refractability of Uba juice to ordinary methods of treatment under the lime defecation process. This difficulty is well recognised as being due to the high percentage of gums and waxes, and recent research in South Africa has shown the possibility of extra difficulty arising due to the presence of starch, especially in under-ripe canes.

In ordinary methods of lime defecation, the treatment of Uba juice entails increased settler capacity and, in those factories which do not return muds to the mills, additional filter press area. In South Africa, where Uba is the main variety,

the factories are equipped with some type of sulphitation plant in order to assist in removing the settling difficulties always present when the process of defecation alone is used.

Recoveries with Uba juice, based upon recognised formulæ for recovery of sucrose entering manufacture, are always lower than the theoretical value. To my knowledge, there is no system of cane payment which resembles that used by Queensland Cane Prices Board. Generally, a flat rate is fixed by the miller in such a manner as to allow a considerable margin to cover low recoveries on the poorer classes of cane. I understand that some system for cane payment has been introduced into South Africa; the scheme is based upon Queensland practice, but I have no definite details of the scheme. As its application is directed towards conditions where Uba cane is the main variety under treatment, further inquiry might be of considerable value in determining a set of factors applicable to the treatment of Uba cane under Queensland conditions.

In a few isolated instances where a payment scheme is in use, the methods of calculation are based upon two sets of determined figures. The first figure is the "normal juice extraction" and is based upon calculations made from the weights of cane and maceration water together with the Brix analysis of the "first expressed juice" entering manufacture.

A Brix factor for the normal juice is obtained under conditions of dry milling.

$$\text{Brix factor} = \frac{\text{Brix of mixed juice under dry milling}}{\text{Brix first expressed juice}}$$

By determination of this factor at regular intervals, factors for the mill train are obtained that correct variations due to variety of cane, &c.

Using this factor, the Brix of the normal juice is determined from that of the first expressed juice. The next calculation comes from the weight of mixed juice entering manufacture.

$$\frac{\text{Weight of mixed juice} \times \text{Brix of mixed juice}}{\text{Brix of used juice}} = \text{Weight of used juice}$$

$$\text{and } \frac{\text{Weight of used juice}}{\text{Weight of cane}} = \text{Normal juice extract.}$$

In some instances, the daily or weekly averages are taken from this figure and applied to all cane furnished during the period. In others, a flat figure (varying from 75 to 82 per cent.) is taken.

For the sucrose calculation

$$\frac{\text{Brix used juice} \times \text{average mixed juice}}{\text{Purity for period}} = \text{Sucrose in used juice.}$$

This is made on the assumption that the purity of the used juice is equal to that of the expressed juice entering manufacture.

$$\text{Finally sucrose recoverable} = \text{Weight of sucrose in used juice} \left(1{\cdot}4 - \frac{40}{\text{Purity}}\right)$$

This method is well known and described in Spenser's "Handbook." In actual practice the method gives satisfactory results when a factory for Boiling House Efficiency—

$$\text{i.e. } \frac{\text{Actual yield}}{\text{Theoretical}}$$

—is applied for any particular factor and determined at regular intervals during the season to correct for seasonal variations and differing methods of manufacture.

As our Queensland factories make no attempt to weigh the juice entering manufacture, such a system is inapplicable, and any scheme for the payment of Uba cane would have to be considered on actual results obtained by some average Queensland factory which has ground Uba cane solely for a period long enough for the data obtained to be of value. The application of the present formula used in Queensland for cane payments for such a cane as Uba would be, to some extent, unfair to the millowner in view of the increased difficulties in milling and manufacture.

The most equitable scheme would be to obtain data from some South African factories and also from Fairymead, and to base a separate scale on these figures for such a time as additional data is obtained upon our own Queensland factories.

In Jamaica, the question of further plantings of Uba cane has been under serious consideration. Quoting from the "Indian Sugar Journal" of May, 1927, page 241, "There appears to be no great danger of many planters adopting the cane permanently if they can grow canes of a better class. The little or no cultivation required, the heavy yield under unfavourable conditions, and the freedom from disease are all in its favour; whilst its fibrous nature, less juice, difficulty in harvesting and milling are on the other side."

For Queensland conditions, it would be inadvisable to grow Uba cane except on those lands where the sugar yields per acre per year are considerably lower than those with other varieties. In such cases, permission to plant the Uba cane should be modified by the condition that—

(1) Sufficient poor land be planted to furnish cane for a reasonable grinding period.

(2) Such cane to be harvested at one time and subject to agreement between growers and millers.

(3) Adequate consideration be taken in fixing the price of cane so that all increased costs of milling, manufacture, and additional equipment necessary to handle the cane be provided for.

HINTS ON ENTOMOLOGY TO CANEGROWERS.

By EDMUND JARVIS, Entomologist.

How to Identify and Control "Army Caterpillars."

During last month (September), larvæ of the common "Army Worm" (*Cirphis unipuncta* Haw.) caused considerable injury to young shoots of plant and ratoon cane in certain localities.

Having been very plentiful this season, growers are advised to look out for caterpillars comprising the second brood, which quite possibly may appear during October in formidable numbers. The occurrence of climatic conditions unfavourable to normal development of the chief parasitic or predaceous enemies of this cane pest are probably largely responsible for such outbreaks. In the case of serious infestations amongst young plants from twelve to eighteen inches high, prompt action should be taken when first chancing to notice the heart-leaves partially devoured, and pellets of excreta from the caterpillars lying between them and around the base of affected shoots. Should the caterpillars prove to be small or only half grown (¾ of an inch long) every leaf may soon be devoured, and plant growth severely checked.

Larvæ of this noctuid moth are striped lengthwise, the fully grown caterpillar—which measures from 1 to 1½ inches long—varying in general colouration from light greenish-yellow to greenish-black. It has three stripes along the sides, the middle one dark and the other two of lighter colour; while along the centre of the back is a narrow white broken stripe, most noticeable behind the head and along the tail-end. Head, greenish-brown, blotched with dark grey or black. Under surface of body, between legs lighter than the back, and more or less mottled.

Eggs of the earlier broods of moths are often laid on rankly-growing grasses in damp, or low-lying situations, from whence the swarms of caterpillars, after having quickly eaten surrounding herbage, &c., travel forward in search of fresh fields to destroy. When an army chances to be of vast dimensions its progress can sometimes be stopped by ploughing deep furrows in front of the line of march taken up by the advancing host of caterpillars; in which case they can be easily captured in holes dug in the bottom of such furrows or trenches, and killed in wholesale numbers.

Ordinary outbreaks can generally be effectively controlled by spraying the cane leaves with lead arsenate, in such manner as to form a poisoned strip or band of about two or three cane rows wide immediately in front of the line of advance. Use 2 lb. of lead arsenate in about 50 gallons of water, taking care to keep the mixture well agitated while syraying it over the leaves, in order to ensure and maintain uniform suspension of this arsenical in the water. In cases of scattered infestation, spray the area affected. Another good remedy is to mix up a poison-bait (1 lb. Paris green thoroughly incorporated with 20 lb. of bran, to which is then added 2 quarts of molasses dissolved in sufficient water to reduce the bait to a thick crumbling mass). Sprinkle pieces about the size of a walnut amongst affected cane rows shortly before sundown.

Large Moth Borer in Evidence.

When 10 per cent. of the shoots of young ratoon or plant cane is found to be attacked all shoots showing "dead hearts" should be cut out, taking care to sever the shoots at a point about 2½ inches below ground level. These must be burnt or crushed to destroy any caterpillars or pupæ. In many cases some of the "dead hearts" collected will have been caused by caterpillars of the "Moth Shoot Borer, *Polyocha* sp., which, together with those of the Tineid Moth Borer (*Ephysterus chersæa* Meyr.), are often responsible for death of the heart leaves of young cane shoots.

CANE PESTS AND DISEASES.

The Assistant to Pathologist (Mr. E. J. F. Wood, B.Sc.) has made the following report to the Director of Sugar Experiment Stations, Mr. H. T. Easterby, on the Babinda district, from 22nd to 30th September:—

Leaf Scald and Spindle Top are widespread throughout the area, though in the case of the former disease the infection is, on the whole, light. Out of fifty farms visited, every one showed Leaf Scald to some extent in every field, and in passing other farms on the "jigger" I did not notice one free from the disease.

The area in which the infection is lightest is Bartle Frere, especially the western end. Here, generally speaking, there are only a few diseased stools in each field, and this is the cleanest place for farmers to buy plants. If those in this area observe carefully to dig out every diseased stool, they will soon have a clean area—at least as far as Leaf Scald is concerned.

Russell River, especially the southern bank, is far otherwise, and some heavy infections were seen both in the Queensland National Bank Estate region and the region opposite Bucklands. Even on the Bucklands road there is fairly heavy infection on some farms.

No. 67 shows slight traces of the disease. In all these places Badila is the main variety grown, but as we approach Pawngilly and Miriwinni there is an increase in the proportion of Clark's Seedling and the Gorus, both of which show serious affection in the acute stage. Reid's Branch, too, shows infection in Badila.

East Russell has a large percentage of Goru and Clark's Seedling; the disease is very evident, and the losses must be considerable. The same remarks apply to Frenchman Creek, Palma, Harvey Creek, Bellenden Ker, and Cucania.

I unhesitatingly suggest that the Gorus should be put on the prohibited list for this area, and that consideration be given to the prohibition of Clark's Seedling, as Goondi has done, in connection with this disease. In the meantime I urge the farmers to discontinue the planting of these varieties, as they are merely serving as foci for infection of our staple northern cane, Badila. We should be taking all the pains we can to conserve this variety, instead of which we are not taking any precautions to keep it free from disease, let alone to improve the variety. The fact is deplorable when we consider how dependent we are on Badila, which is one of the world's finest canes in suitable locations.

Q. 813 seems to do well if planted late, and should do well on soils which are not suited to Badila, but only on those. It is apparently rather resistant to Leaf Scald, though it has not been tested sufficiently to give us any definite data. Being inclined to lodge, it should not be planted before August. It is a good ratooner, and has usually a good c.c.s. E.K. 28 might also be tried, but I have no evidence of its resistance to Leaf Scald. I should imagine it to be fairly susceptible from its susceptibility to other diseases.

Spindle Top has caused the trash to adhere to the canes, and the adventitious roots have sprouted, firmly binding it thereto. This has worried a number of farmers, but is probably due in part to the cyclonic disturbance at the beginning of the year. It is especially bad in the Bartle Frere area, and this unfortunate fact minimises the advantage of the freedom of this area from Leaf Scald. However, it is not confined to this place, but also occurs fairly badly on every farm visited, in Badila, H.Q. 426, and Q. 813. Of course, it is especially bad in grubby areas. The prevalence of this trouble makes it imperative that a change of seed be obtained as soon as possible from such a place as the Tableland, and efforts should be made to arrange this and also for the distribution in the Babinda area. I have prepared samples of Leaf Scald and Spindle Top for the mill, and farmers whom I have not visited can see them there.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report from the Assistant to Pathologist (Mr. E. J. F. Wood, B.Sc.) for August and September:—

INNISFAIL.

Two diseases are in need of attention in this area—Leaf Scald and Spindle Top. Leaf Scald has been described in my previous reports, and has been dealt with in Mr. D. S. North's bulletin. The carrying out of the recommendations I have made will control the disease. Just at present it is not showing up to its full extent in some areas, and the Colonial Sugar Refining Company's pathologist at Goondi (Mr. Trivett) finds it difficult to detect just now. The Innifail Estate, which I am told suffers badly, seems now fairly clean, though stools were observed there which showed the disease. Goondi, however, seems the cleanest area, though Scald was seen at Darradgee, Upper Darradgee, Garradunga, Eubenangee, Sundown, Goondi itself, and Mundoo.

South Johnstone is the worst infected, and in all the H.Q. 426 and Goru the losses are considerable. Around Basilisk, Miskin's Siding, Nos. 1 and 2 Branches there are some badly diseased fields of Badila, and at Jappoon, between this place and Silkwood, No. 3 Branch and No. 5 show far too much of this disease. As a district Silkwood and No. 4 form the worst centre of infection that I have yet seen, and on one field of young plant H.Q. 426 many of the plants are quite dead, while others are showing the chlorotic stages. The field will probably have to be ploughed out before harvesting. This is the state of things we arrive at by neglecting the selection of seed. This area shows the necessity of a field officer attached to the mill with the duty of controlling the planting. The sooner this state of things comes about the better.

Mourilyan has its share, though the infection is lighter than at South Johnstone. Liverpool Creek, which was the worst area, has been cleaned up and the worst fields ploughed out. The disease is still present on almost every field, but to a very limited extent, and the time for digging out the affected stools is at hand. If this is done the disease should be completely controlled. Sandy Pocket, Rafa, Boogan, Moresby, Mourilyan, and the Harbour line all show the disease, and on at least one farm at Mourilyan the trouble is epidemic in Badila and H.Q. 426.

The disease is in the chronic stages in Badila and Pompey, and in the acute in H.Q. 426. These two latter canes should, in my opinion, be discontinued owing to their susceptibility, and as the returns from Pompey are, as far as I can gather, very poor, there seems no reason for its retention. As for Badila we must try to select the seed and to introduce some new strains.

Spindle Top.

This name for the disease, for which we have to thank Mr. A. P. Gibson, is rather a fortuitous one, as the main symptom is a rapid thinning out of the top of the cane stick. An alternative name, which is also apt, is Needle Top. It is well to have a popular name (for Pink Sclerotial Disease of the leaf sheath is a mouthful and means nothing to the farmers) to distinguish this trouble from Top Rot, which it superficially resembles. The reddening of the leaf sheaths is characteristic of the disease, and the cane becomes trashbound. The black fruiting bodies of the causative fungus can usually be seen when the sheaths are pulled apart.

That the trouble is due to a fungus of the sclerotial type is known, but much research remains to be done before we can give a definite statement regarding this trouble. This fungus binds the upper leaf sheaths, and chokes the stem and growing point of the cane, which in time will die, and the cane will often rot. The rot is secondary, and it is strangulation that causes death.

This year the disease is widespread, and is causing losses which have in some cases been estimated at over five tons per acre. On most farms quite a percentage of the sticks in each stool are dead or affected, and, in many places, whole patches and whole stools are dead. I am told that the disease is rarely as severe as at present, and it is considered that the flood and cyclone at the beginning of the year have had a great deal to do with it. Areas which have been flooded, or which are affected with grubs, show the disease in all its virulence, and it is usually thought that it is due to a primary check in growth. It seems certain that the weather is a determining factor in the occurrence of the disease, as is probably the case with most of our troubles.

I do not know of any experiments which have been carried out in connection with the transmission, but we can make some pretty sound assumptions. The fact that the sclerotia cling to the leaf sheaths and have been seen clinging to the

rind of the cane, shows us that it can be carried with plants into fields which were previously unaffected. It will also be present on the trash left on the field after cutting.

Now, these facts lead us to the obvious conclusions that plan selection will be a control measure, and so I suggest that all canes showing the disease (these are usually red in contrast to the black of healthy Badila) be rejected when planting.

Secondly, the burning of trash is a control measure where the disease is severe, but this is a matter of compromise, for there are great benefits to be derived from the ploughing in of trash. In cases where the percentage of infection is high I recommend that the trash be burnt, but in other cases it is a matter for the discretion of the farmer.

A third measure which the nature of the disease suggests is the disinfection of plants, but experiments will have to be conducted before any recommendations can be put forward.

As Badila is the principal cane infected, and is also the staple variety of the North, it is important that some investigations should be made of the diseases which affect it, and also that the most promising of our seedling canes be tried out under supervision in order to have some tested varieties to fall back on in case of need.

Subsidiary factors which may affect this disease are grubs, drought, flood or cyclonic weather, sodden ground, bad tilth, or bad soil conditions due to impoverishment of the soil.

I do not believe in the promiscuous distribution of varieties, but the planting of trials under supervision will enable us to select one or two which will have desirable qualities, and will be worth propagation on a field scale.

The Director of the Bureau of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report from the Southern Assistant Entomologist, Mr. R. W. Mungomery, of investigations for the month September-October, 1927.

Effect of "Stinking Roger" *(Tagetes grandulifer).*

Several plants growing in different parts of the world are known to possess poisonous properties, which can be utilised by man in his attack on the insect forces. Powdered hellebore root which contains a poisonous alkaloid, and pyrethrum flowers which give off poisonous vapours are well known examples. Most probably with the above facts in mind, many of our more observant farmers have credited the common weed "Stinking Roger" with the possession of similar properties, asserting that it is actually instrumental in killing cane grubs. Those who have knowledge of this weed will easily understand how this assumption has been made and so widely circulated. "Stinking Roger," well known in the southern districts, possesses a distinct odour, and also certain urticating properties, which are, at times certainly very unpleasant to man. Irritation from this source is often experienced by the uninitiated during hot sunny weather, when scarifying in cane where this weed is growing. As the implement is dragged along the cane rows, the leaves of the weed brush against the backs of the hands. This produces a reddening of the more tender portions of the skin with an accompanying painful itch. Moreover, one often hears of instances where this weed has been growing prolifically and grub damage has been unknown, and this together with its other well known properties has probably had the tendency to become a kind of folk-lore. In certain districts, therefore, there now remains a belief that where "Stinking Roger" grows, no grub damage occurs. In this manner a kind of half-truth has been accepted and made a general rule.

That this is incorrect was proved by field evidence in the Mount Jukes area of the Mackay district, where the grub damage witnessed by the writer during the past two seasons has been of a severe nature, and there this weed comes very much into prominence in the canefields. In this district, at least, there is no faith in "Stinking Roger" ever proving the salvation of their grub-infested crops.

As most popular beliefs usually have some element of truth for their foundations, it was thought that this matter warranted closer investigation with a view of gaining more knowledge of this weed in its relationship to cane grubs. Experiments were accordingly carried out at the Bundaberg Laboratory.

In the first series of experiments, the leaves of the plant were chopped up finely and mixed with soil in cages, and a cane grub (*L. trichosterna*) was placed in each

cage. In another case the flowers and young seeds were used in a similar manner, but in no case did the grub show any signs of weakening or flaccidity which usually precedes death. This result was obtained even though the earth in the cages smelt strongly of the essential oils which so characterise this weed.

A second series of experiments was later conducted in which "furfuracea" cane grubs were used throughout the tests. On examining the cages after they had been set up a few days, some of these grubs were found in the act of eating these leaves, upon which they apparently thrived, for they seemed quite as healthy and normal at the conclusion of the experiment as at the beginning. As a crucial test, this weed was pounded up in a mortar and the juice was extracted from it. Each grub was then completely immersed in this juice for a few seconds and later transferred to cages containing moist soil, but it was found that this in no way inconvenienced the grubs, and results from these tests were equally convincing that the weed possessed no insecticidal properties as far as two of our worst cane grubs were concerned.

This experiment confirmed previous experimental work carried out by Mr. Jarvis with "Stinking Roger," but in his case cane grubs of the "greyback" beetle were used. However, this was not the primary object in view, for it was thought possible that with our southern grubs representing different species of different genera, results might vary somewhat. Thus the experiment was repeated using our southern cane grubs, but the results coincided with Mr. Jarvis's findings. He showed than "cane grubs have a decided liking for leaves of this weed." In this way, it is highly probable that when this weed is ploughed under grubs will feed on it, and not be forced to turn their attentions to the cane stools, and this would serve to explain how some cane crops suffer less when this weed has been growing on cultivated land. Whether it is effective in warding off ovipositing beetles still remains an open question, but from experience at Mount Jukes there seems little to support this contention.

Effect of Subsoiling.

It is the custom on several of the larger plantations in the Bundaberg district to carry out subsoiling operations after cane has been ploughed out and previous to the planting of another crop. From an entomological viewpoint, this should be carried out during the months of September and October in order to gain the utmost of an advantage which this system possesses over ordinary ploughing. During these months cane grubs which are about to turn into beetles and emerge in the following November or December are either in the helpless prepupal stage or have already turned into pupae. Both of these are located in nicely fashioned earthen cells, at an average depth of about 15 inches, so that the ordinary plough generally skims over the top of them. However, when the tines of the subsoiler pass through the soil they usually crush or break these cells. If the cell be crushed the grub or pupa naturally suffers a similar fate, but if the cell be merely broken or disturbed, the surrounding soil falls into it. In this latter case the grub is too helpless to make another cell for itself and further, both it and the pupa (whichever the case may be) are then unable to cast off their skin when passing into the succeeding stage, with the result that the insect emerges a cripple. Thus, by preventing the emergence of beetles which are likely to reinfest the same fields, the practice of subsoiling carried out during the above-mentioned period has far-reaching effects.

The Director of Sugar Experiment Stations, Mr. H. T. Easterby, has received the following report from the Assistant to Entomologist, Mr. G. Bates, on the Pialba and Nambour Districts.

PIALBA.

This district was visited during the early part of August and was found at that time to be free of any serious insect damage. However, despite this, certain insects are at times responsible for injury to cane on individual farms, wireworms being the chief source of annoyance.

Wireworms are larvæ of Click Beetles, belonging to the family Elateridae. These beetles are often seen around the lamps during the summer months, and can be recognised by their habit, when turned on their back, of jumping upward and landing right side up. The larvæ (or wireworms) can be recognised as being

cylindrical, body shining yellow in colour, with a dark-brown head. They vary greatly in size, but when brought under the notice of the growers by damaging cane, are then from 1 to 1½ inches in length. They live underground and cause injury to cane by eating the eyes of sets and chewing through the base of the young shoots. From information gathered it appears that the bulk of damage is occasioned during August, due most probably to the fact that a large portion of the planting is done during that month, and perhaps owing to weather conditions, as the sets do not strike as quickly as those planted later in the year, thus giving the wireworms every chance to attack them and destroy the eyes. At the time of my visit practically no land had been planted up, so that up to the present little damage had been reported this year, but is likely to occur to cane planted during the present month or later.

As the life history of these particular wireworms has never been worked out or studied in detail, no definite basis of control can be laid down, but growers can tend to minimise the damage by thorough cultivation and the use of good healthy plants, thus giving the crop a start without any undue handicap. Wireworms are plentiful in land growing paspalum and other grasses, and when these lands are given two shallow ploughings and planted up, the grower is simply courting trouble. Poor cultivation and the use of inferior plants is in itself sufficient to cause a poor strike, sets lying a long time in the soil without germinating, and then throwing sickly and slow-growing shoots, and it is in places such as these that wireworms cause considerable damage, for when shoots are eaten off the plant has insufficient stamina to throw another from the base of the injured one.

Moth Borers (*Phragmatiphla truncata*).

The caterpillars of this insect which tunnel the sticks of large cane and the shoots of young ratoons are to be found on practically every farm in the Pialba district to a greater or lesser degree. They are particularly noticeable along headlands and where cane has been allowed to become weedy. The prevalence of this insect in the Pialba district this year is probably due to the fact that owing to weather conditions, which made clean cultivation impossible, cane became weedy and headlands overgrown, thus giving rise to ideal conditions for the breeding of this pest.

The Black Beetle.

Several growers complain of injury to young cane by a species of beetle commonly referred to amongst themselves as the "Black Beetle," and which is known to science as *Pentodon australis*. The damage by this beetle is similar to that caused by wireworms, the beetle chewing the eyes of sets and young shoots, as well as burrowing into the set itself. Injury by this beetle has not been so noticeable during the past two years as formerly, and so far this year no damage has been recorded.

Grubs.

Third stage grubs of an undetermined species of Scarab beetle were found damaging ratoon cane in red soil in one portion of the district. The grower has not had any damage previously, and this year it is not serious, only a few stools being eaten, so that this species cannot as yet be classed as a serious cane pest.

Grubs of the Christmas beetle (*Anoplognathus boisduvali*), and *Dasygnathus australis-dejeani*, were found under cane and in cane land, but not in sufficient numbers to be capable of causing appreciable injury to cane.

NAMBOUR.

Grubs.

"White Grubs" are to be found in all parts of the Nambour district, and at times are responsible for more or less serious damage. Ratoon cane is not injured to any extent, the damage being mainly confined to young plant. The grubs attack the sets as soon as they are planted, eating the eyes and young roots, besides chewing into the set itself.

While there are several species of white grubs to be found in cane land in this district, the most common are those of the Christmas beetle (*Anoplognathus boisduvali* Boisd.). They are particularly plentiful in paspalum land, and for that reason are known to most of the farmers as the "Paspalum Grub." When this land is broken up and cane planted without first thoroughly cultivating the soil,

damage is most likely to occur, and although grubs of the Christmas beetle are not such voracious feeders as some of the other well-known cane beetle grubs, they are, given suitable conditions, capable of causing considerable damage. So far this year the damage has been slight and growers remark about the scarcity of grubs seen while ploughing, and some of them attribute this to the heavy rain which fell towards the latter end of last year, when the ground became waterlogged, and grubs could be seen floating about and lying dead on the surface of the ground.

The Black Beetle (*Pentodon australis* Blk.).

This is another insect pest of the Nambour district and one with which most growers are familiar. It is capable of doing considerable damage to young plant cane, and was troublesome in certain parts of the district about two years ago. Since then the losses caused have not been serious, and so far this year no damage at all has been recorded. The beetle often flies to light and is plentiful in paspalum land.

Moth Borers (*Phragmatiphila truncata* Walk.).

This insect is to be found on practically every farm, and with the exception of a couple of instances is only responsible for minor damage. This is mainly confined to headlands, and except where cane is required for plants, very little damage is done. The presence of a small Braconid wasp, which is parasitic on the larva of the moth borer, is a big factor in keeping this insect in check.

Rats.

The depredation of rodents is to be seen in several parts of the district, chiefly on the low-lying country towards the junction of Petrie Creek and Maroochy River, also in one or two places on the river. The damage caused at present is not alarming, but could easily become so, and growers would be well advised to keep them under control by spreading poison and destroying the undergrowth that harbours them. Ripe bananas, poisoned with strychnine, is said to give splendid results and may be worth a trial.

Redbills or Water Hens.

These birds are sometimes responsible for damage to cane similar to that caused by rats, except that they leave the internodes more shredded, whereas the rats make a more or less clean wound.

MARYBOROUGH AND MOUNT BAUPLE.

A few days were spent in these districts towards the end of August, and at that time they were found to be free of any damage by insects, the farmers being more concerned with losses from diseases.

Moth Borers (*P. truncata* Walk.) and Mealy Bugs (*Pseudococcus calceolariæ* Mask.) were the only insects seen in any numbers, and these were only doing minor damage that does not call for any control measures. Crickets were also found in cane land and were, in one instance, reported to occasionally damage young cane.

Other minor pests such as Mealy Bugs (*Pseudococcus* sp.), Leafy Hoppers (*P. saccharicida*), and Aphis sp., were found in small numbers in several parts of the district. These would, in all probability be more numerous during the warmer months of the year.

FIELD REPORTS.

The Northern Field Assistant, Mr. A. P. Gibson, reports (3rd *October*, 1927):—

INNISFAIL.

Goondi.

This mill does not depend on the Government railroad for the transport of its cane supply or the getting-away of its sugar; the latter is wholly removed by several small floaters which steam up the Johnstone River to the factory and take away upwards of 270 tons of sugar per trip direct to Cairns. The factory is expected to crush some 158,000 tons of cane; it has had a good run and is treating big weekly tonnages, and speedily clearing its area of millable cane. Harvesting is about up to expectations. Some neglected fields were noted; these are generally a menace to the surrounding good ones.

Badila (N.G. 15) and Pompey (7 R. 428) are the varieties grown. The latter cannot be classified among the good varieties; besides being rather low in quality, it is becoming highly susceptible to most diseases. This cane is sometimes recommended for the poorer soil. It, however, is too frequently grown on our better lands. The area planted to this kind is fortunately being rapidly decreased, and that of Badila increased. Some of the undulating volcanic red soil areas more recently planted with cane and yet stumpy are being cleared in readiness for the plough. Working soils (especially the clayey kinds) when overwet upsets the physical condition. Although this is generally known, yet it is frequently done, as otherwise the whole routine of field work would be delayed. Areas tilled when wet may be detected easily; generally they are very lumpy and appear dry. Some farmers roll the trash in ratoons and plough in when turning out the old stubble; others burn everything. The make-up of the trash is mainly derived from the soil, air, and water, therefore the soil is naturally enriched when this is returned to it. It is sometimes very necessary to destroy trash by burning in order to control destructive pests and fungi. Tractors, big and small, wheel and caterpillar action, are going their hardest, drawing various makes of implements suitable for all classes of field culture.

Stools of Leaf Scald disease and Spindle Top were noted throughout the area; the latter is too prevalent and is responsible for big annual losses. This is occasioned by a fungus which binds the sheath to stems—generally one or two canes are troubled; whole stools, however, frequently perish from the effects. The non-planting of such canes and trash-burning would help to control this fungus. Smothered canes or those having had their growth checked invariably are affected. The growing tendency is to place Badila seed too close, which is responsible for cramping, smothering, and probable increase of Spindle Top.

Weevil borers were very active in parts. This is probably sugar's second greatest pest; its spread might be arrested by the Tachinid fly—one of its known parasites—clean fields, and more careful plant selection.

Mourilyan.

The value of efficiency in field and factory is being more understood; this is of paramount importance and should ever be our goal.

Improvements.—The efficiency of the local mill has been raised remarkably since the installation of larger and more powerful crushers. When the boiling-house has been enlarged and modernised few mills in Queensland will be superior.

Milling.—The factory is working well and treating its greatest crop in record time. One thousand two hundred and thirty-five tons of cane were milled during the twenty-four hours ending 4 p.m., 9th September. The weekly mill average c.c.s. is excellent, being 15.95 per cent. Some 6.4 tons of cane are used to make a ton of sugar. Eighty-six thousand tons had passed between the rollers, just over one-half of the crop estimated. Under 3 per cent. of the cane being crushed is burnt by permission. When the factory was visited the management were worried, as it was obvious that the mill must soon cease operations unless some of its stored sugar was removed. Three thousand tons of bagged sugar were stacked under the mill roof, where it is likely to deteriorate; extra labour was needed to stack much of this. The weekly output of sugar is now over 900 tons; this has been gradually accumulating. It seems very evident that the number of ships visiting this port is inadequate to remove the district's ever-growing annual supply of manufactured sugar. What would the position have been had the South Johnstone Mill been crushing normally?

Crops.—Crops looked remarkably well, and continue to grow slowly. They appear to have about reached the degree of excellence so far as quality is concerned, and are harvesting quite up to early expectations.

Chief among the varieties grown is Badila (N.G. 15). Of this kind there is about 99 per cent. It is gratifying to note that the management is endeavouring to eliminate Pompey (7 R. 428), a cane generally low in quality and purity. The following is what they have to say about it in a circular recently issued to its growers:—

"Already 1,000 tons of this kind have been milled. The average c.c.s. of the plant has been 8.9 per cent., that of ratoons 10.65 per cent. The minimum c.c.s. was 7.05 per cent., the maximum 10.9 per cent. In addition to the low c.c.s., the purity of the juice is also low. As a comparison with Badila treated to the same time, the following figures may serve to explain further the unprofitableness of growing this variety:—

With sugar at £21 1s. per ton—

Pompey (7 R. 428), plant 8.99 c.c.s.—19s. 6½d. per ton.
Pompey (7 R. 428), ratoons 10.65 c.c.s—26s. 1½d. per ton.
Badila, plant and ratoons, 13.65 c.c.s—37s. 4¼d. per ton.

If the growers are wise they will refrain from the further planting of this kind. A small apparently healthy patch of B. 208 was observed growing on a brown porous soil at Moresby, and in growth somewhat surpassed that of Badila and H.Q. 426 interplanted amongst it.

Field Work.—Great activity prevails on most farms; the weather is perfect for all outside operations. Tractors are wonderful helpers in speeding up this class of work. Trash dry and of a medium thickness was being successfully ploughed under by a tractor-drawn Saunders plough. Fields harvested some ten weeks ago had been improperly cultivated and replanted. Many of the old stubbles had not been ploughed out, and what had been lay thickly over the area. The former frequently serves to carry on a disease, the latter hampering considerably all subsequent cultivation.

Different kinds of manures at different rates are being applied to the plant and ratoon crops. Coral from the shores of nearby islands is being pulverised and boated over to the mainland for use as lime in the sugar fields. Flue dust is being broadcasted over some of the adjacent mill farms. This dust is likely to contain much potash, especially that taken from mills burning most of their molasses.

Diseases.—Leaf Scald, Spindle Top, Weevil borer, big moth borer, tineid moth borer, and rats are responsible for more or less damage throughout the area. Farmers should get to know these pests and diseases, and refrain from planting affected canes.

South Johnstone.

The question of the moment is how much of the big 1927 crop will be harvested; this of course is dependent on subsequent weather and period of crushing. At present it is obvious that a large area will remain uncut; big crops of matured cane when left over generally grow heavy, tumble, become rank, and greatly injured by weather and vermin.

Grinding.—This is the time when the cane possesses its maximum amount of sugar, when the weather is generally at its best, and when all factories go their hardest—many even work overtime in consequence.

Crops.—The almost rainless weather this and last month has now retarded the crop growth and has immensely benefited the outlook from a sugar point of view.

Small, apparently unfruitful patches were again met with in the porous volcanic red soils; such a condition may easily be distinguished by the absence of chlorophyll (green matter) of leaves. This points rather to the probable deficiency of food or foods, possibly potash.

Silkwood.

Diseases.—Leaf Scald is too prevalent in this area, being severe in most varieties grown. The eradication of the Goru family, the growth of less H.Q. 426, more Badila, and the use of disease free seed is urgently recommended. Gum-like streaks were found in H.Q. 426 at Silkwood. Cutting plants by contract is not a good idea –anything that will help to fill up a bag is frequently classified as a plant by the contractor. It would be difficult to find fields absolutely free from Scald at Silkwood and parts of South Johnstone; even paddocks of newly-planted H.Q. 426 were already dying out in parts from this disease.

NOTES ON THE BREEDING OF CERTAIN FRUIT FLIES IN CAPTIVITY.

By HUBERT JARVIS, Entomological Branch.

The Queensland Fruit Fly (*Chætodacus tryoni* Frogg.).

Although the period occupied in the development from the egg to the perfect insect of the fruit fly, *Chætodacus tryoni* Frogg. and other allied species has long been known, it is only recently that the Queensland fruit fly, *C. tryoni*, has been induced to mate, oviposit, and complete its development in captivity. The following information was secured by experimental work carried out at Stanthorpe, during the season 1926-27.

On 10th January, a large field cage 6 feet high, 8 feet long, and 6 feet wide was placed over a small apple-tree in an orchard. This tree was carrying a crop of forty-eight apples of the variety known as Delicious. Each apple was carefully examined and found to be clean and sound. The soil around the tree was cleared from weeds, &c., and all possibility of the escape of flies or maggots eliminated.

On 18th January, about one-quarter of a bushel of maggot-infested fruit was placed in the cage on the ground around the tree. This fruit contained fruit-fly maggots in varying stages of development, the largest being about three-quarters grown.

The first fruit flies emerged in the cage on 7th February, and at the end of the month fifteen or twenty flies could be easily counted. The flies were fed twice weekly, on a dilute sugar and water solution, and from this date onward the fruit was periodically examined for oviposition.

On 21st March, the first stung fruit was observed. The maggots at the time were all in an early stage of development, the largest being about one-quarter grown and the smallest just emerged from the egg. On the date in question males and females were observed together on the fruit, and in one or two instances mating was noted at 10 a.m. Only a few apples were found at this date to be stung, but by the end of the month my assistant, Mr. S. M. Watson, reported additional apples infested, and at the conclusion of the experiment fourteen apples out the forty-eight were found to be infested.

It would appear therefore that the pre-oviposition period of *C. tryoni* in normal summer weather, under the conditions prevailing in the cage, is of at least a month's duration, and it is probable that oviposition first took place about 10th March.

Although no definite data in regard to the mating and oviposition of the Queensland fruit fly has yet been secured, the information obtained is of interest, demonstrating as it does, for the first time, that the fruit-fly will mate and oviposit in captivity under the conditions mentioned.

The Jarvis Fruit Fly (*Chætodacus jarvisi* Tryon).

The fruit fly *Chætodacus jarvisi* Tryon although of less economic importance than the foregoing species, arriving as it does much later in the season than *C. tryoni*, nevertheless does considerable damage to pommaceous fruits during the months of February and March.

It made its appearance in the orchards this season on 17th February, and on that date a number of living specimens were collected for experi-

mental purposes; the following experiment proves that this fruit-fly will oviposit in captivity, even when confined in a small cage.

A wire gauze flyproof cage 18 inches in diameter and 2 feet in height, was placed on a wide tray containing damped soil. From the roof of the cage one apple of the variety known as Jonathan and one pear of the Winter Nelis variety were suspended; the fruit selected was in a ripening, but not ripe condition, the apple being slightly more mature than the pear.

On 19th February twenty female flies and ten males were liberated in the cage, and they were daily supplied with small pieces of freshly-cut apple and pear on the juices of which they fed greedily. Oviposition took place on 3rd March in the apple and on 11th March maggots were found to be from one-quarter to half grown. The apple was accordingly removed and placed in a breeding jar. Puparia were found under the fruit on 21st March and the flies began to emerge on 12th April. Thus the life cycle of this fruit fly was completed in captivity in about five weeks and five days.

During the experiment the flies were observed to repeatedly visit the pear and feed on some slight exudation on the surface of the fruit, but they did not oviposit, and the pear remained in a sound condition at the conclusion of the experiment.

Although the fruit fly *C. jarvisi* was much more abundant in the orchards during the months stated than was *C. tryoni*, breeding experiments from fruit collected at the end of February showed, on the flies emerging, *C. tryoni* 20 per cent. in excess of *C. jarvisi*.

PROTECTION OF NATIVE FAUNA.

The Minister for Agriculture, Mr. W. Forgan Smith, in commenting recently on the matter of the protection extended to native fauna in Queensland, mentioned that the revenue derivable from the royalties on the sale of opossum and bear skins had already been instrumental, and would be much more so in the future, in materially assisting his Department in the preservation of our desirable native birds and animals. Some eight months ago, he had been able to appoint five full-time rangers. These had been stationed in different parts of the State, and, judging by the numerous inquiries that were now being made on native fauna matters practically every day in his Department, they had all made their presence felt in each of the districts in which they are stationed.

Owing to the non-existence in the past of stipendiary inspectors, due to the absence of funds, many of the provisions of the Animals and Birds Acts had been, up to this year, to some extent inoperative; but with the appointment of officers, whose time is exclusively devoted to ensuring the enforcement of the law, a far better measure of protection to our birds and animals is now afforded. The fact that within the past three months there had been forty-five convictions for breaches of the law is further evidence of the rangers' activity. In saying this, Mr. Forgan Smith added that he was still quite appreciative of the splendid work that had been done in the past by the honorary rangers, of whom his Department had 294 enrolled. The Police had been, and were still, ably co-operating in the work.

The whole of the royalty received on the account of opossum and bear skins is placed to a special fund, which is earmarked for the sole interests of our native birds and animals which have an economic or other value.

There are at present in Queensland 154 sanctuaries with an aggregate area of 1,500,000 acres, and no birds or animals can be trapped or shot in these. Here again, the full-time inspectors were ensuring that these reservations were sanctuaries not only in name but in reality.

The Minister hoped to be able to do something with the funds at his command in the direction of a further restocking of districts which had been denuded of native bird and animal life from districts where they were still plentiful.

IRISH BLIGHT OF TOMATOES.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

Irish Blight is commonly considered as a disease of the potato rather than the tomato, since it was in connection with the former crop that it first reached economic importance. The disease is due to the attack of a fungus parasite—*Phytophthora infestans.* It was apparently introduced into Europe from South America, the original home of the potato, some time prior to 1842, for at this time it has been recorded as being well established in Europe. In 1845 a serious epidemic occurred in both Europe and North America, of which one of the results was the noted Irish famine. Further severe outbreaks have occurred since then when climatic conditions have been suitable. The tomato is a close relative of the potato, and for that reason several of the diseases affecting one have been able to attack the other. Of these Irish Blight is an example.

Symptoms.

The first easily noted signs of the disease take the form of dark-brown patches on the leaves, commonly working in from the margin. If the weather is at all wet these areas will assume the appearance of a soft rot and enlarge rapidly. Finally, the entire leaf may become affected and shrivel up. Blackish patches also occur on the stem and leaf stalks. The disease in this case may produce complete cincturing, when the whole of the outer portion of the branch affected will wilt and die. Under moist conditions there will be seen on the under surface of the leaves and on the stem covering the brown areas a delicate whitish down formed by the fruiting bodies of the fungus as they project out from affected tissue. The grower's attention is usually more especially attracted to the disease when the fruit is attacked. A somewhat diffuse light-brown patch arises on the skin of the green fruit. This enlarges and may finally cover a large proportion of the surface, at the same time turning a dark though somewhat mottled brown colour. The margin of the discoloured area may be definite or may diffuse gradually into the general green of the healthy skin. On cutting through an affected area the discoloration will be seen to extend right through the skin of the fruit and may penetrate even the pulp and septa. Very often the fruit rot extends to considerable dimensions before the fructification is produced. This appears later during humid weather as a delicate white mould on the surface of the affected region. The fruit may sometimes constitute the main portion of the plant attacked.

Causal Organism.

The fungus causing Irish Blight in its ordinary growing stage is very similar to most other fungi, and consists of clear slender-branched threads or mycelium—these threads being less than one-thousandth of an inch in width. They ramify among the cells forming the plant tissue, absorbing nourishment for themselves, and thus bring about the destruction of the invaded part and produce the symptoms described above.

If the weather is sufficiently moist the fungus after a few days vegetative growth will commence to form its fruiting stage. Short aerial threads or hyphæ grow out through the breathing pores situated on the under surface of the leaf and other parts attacked. These branch three or four times, and on the ends of the branches are formed delicate lemon-shaped spores or fungus seeds. These spores are produced in

enormous numbers and are so minute that they can easily float about in the air and thus serve to spread the disease throughout the field. Should a spore come to rest on a tomato plant moist with dew or rain, its contents divide up into from six to twelve smaller portions which escape from the spore case and swim round in the surface moisture by means of two vibratile filaments. These swarm spores, as they are called, soon come to rest and send out a slender thread known as a germ tube, which penetrates the surface of the plant, and commences once more on a period of vegetative activity within its tissues. If conditions are not suitable for the development of swarm spores, which must have moisture for their existence, the spore itself may sometimes develop a germ tube direct.

Contributing Conditions.

Unlike those of many fungi the spores of *Phytophthora infestans* are thin-walled and delicate, and are therefore restricted to certain ranges of temperature and moisture for their development and continued existence. Probably the best temperature for the development of the disease lies between 60 deg. and 70 deg. Fahr. The spores are killed if the temperature approaches 80 deg. Fahr. for any length of time, and at temperatures round about 90 deg. Fahr. the mycelium itself soon dies out in the leaf tissues. For the germination of the spores leading to spread of the disease abundant moisture is necessary, either in the form of heavy dews or rain with accompanying humid conditions. Thus for the occurrence of an epidemic there must be a certain combination of temperature and humidity. In Queensland a temperature suited to the development of Irish Blight is only likely to occur during the cooler months. This period usually coincides with the dry season, hence this disease in normal years does not reach serious proportions. However, it sometimes happens that a period of wet weather occurs during the autumn, winter, or early spring growing season, and considerable loss from Irish Blight is the result. This was well illustrated by the outbreak of Irish Blight in the Bowen district during July-August of this year. Rain to the extent of 1·8 inches fell on 23rd and 24th July accompanied by a sudden fall in temperature, the daily maximum from 23rd July to 3rd August ranging from 57 deg. to 77 deg. Fahr., with an approximate daily average of 58 deg. Fahr. With the advent of hot, dry weather the loss from Blight rapidly diminished. Somewhat similar conditions occurred, on 5th, 6th, and 7th July, and it is probable that the disease commenced to develop at this time though not to an extent sufficient to attract attention. Growers should, therefore, be prepared to take steps to minimise the loss from Irish Blight. The precautions necessary will also aid in controlling certain other leaf diseases to which the tomato is subject.

Control.

(1) General farm sanitation will go a long way to control most fungus troubles. Plants dying apparently from disease should be immediately removed and burnt. If leaf disease has been present the whole of the crop should be destroyed after harvesting is completed. When possible the same ground should not be planted to the same crop two seasons in succession. Tomatoes should not follow potatoes and vice versâ. The planting of potatoes should be avoided altogether if tomatoes are the main crop.

(2) Bordeaux or Burgundy mixture has been shown to give an effective control over Irish Blight if properly made and applied. The plants should be sprayed when about 6 inches high, and again as often

as necessary to keep the foliage well covered with poison. The number of applications will depend on weather conditions. During wet periods spraying may have to be done every few days, as it is at this time that the spores are best able to germinate and the protective covering of spray is liable to be washed off by the rain. The spraying should be thorough in order to ensure that both upper and lower surfaces of the foliage are covered.

The preparation of both the above mixtures consists essentially in the precipitation of an insoluble copper compound, which although not injurious to the plant will yield sufficient poison to prevent fungus spores germinating.

For Bordeaux mixture there is used 6 lb. bluestone (copper sulphate) and 4 lb. quicklime to 50 gallons of water.

Burgundy consists of 6 lb. bluestone and 8 lb. washing soda to 50 gallons of water. This mixture is the more favoured of the two in some districts as it is somewhat easier to prepare and good quicklime is not always available. Care must be taken that there is no excess of soda, as unlike lime this substance may injure foliage.

There is little to choose between the fungicidal values of the two mixtures when properly prepared. About 50 to 100 gallons will cover an acre, depending on the type of spray pump used and the size of the plants.

The bluestone is dissolved in half the quantity of cold water in a wooden vessel. This is best done by tying the crystals in a piece of hessian, &c., and leaving them suspended in the water over night. Pulverised bluestone may now be obtained which is quickly dissolved.

The quicklime or washing soda is added to the remainder of the water in another vessel. Quicklime is best first slacked by the gradual addition of small quantities of water, as the heat generated will aid the reaction.

The two solutions—bluestone and lime or washing soda—are then poured simultaneously through a strainer into a third container or the spraying vessel and the mixture stirred well for a few minutes.

Only wooden or copper vessels can be used to contain bluestone solutions, as this chemical will eat through iron.

It sometimes happens that the lime or soda used is not of good quality and the resultant mixture may then contain a surplus of bluestone. This must be avoided as copper sulphate is capable of causing injury to the plant. An excess may be tested for by allowing the gelations precipitate to settle out of a portion of the spray and then applying red and blue litmus paper to the clear liquid remaining on top. If the blue paper is turned red, more lime must be added until no change takes place. If Burgundy is being tested and the red paper turns blue, more bluestone will have to be added as free soda in this case may also cause spray injury.

A rough test for excess bluestone is given by allowing a clean knife blade to remain in the mixture for a few minutes. When this shows a brown coating of copper on removal, more lime or soda is required.

The spray should be applied as soon as possible after preparation as it tends to lose its gelatinous nature and settle out.

COTTON CROP PROSPECTS.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, informed the Press recently that from reports which had been received from the Departmental field officers, it appeared that the planting conditions over the whole of the Cotton Belt were the best that had been experienced in recent yars. Not only had excellent rains fallen, but the standard of the preparation of the seed bed was of a decided improvement over those of recent seasons. The experiences of growers, in nearly every district during the past seasons, have demonstrated conclusively that early prepared seed beds are of marked advantage in obtaining an early planting. It also has been demonstrated that early planted crops afford a better insurance of obtaining larger yields. Those facts are impressing the growers more forcibly each season, and this past winter has seen most of the growers endeavouring to prepare their land at the earliest opportunity.

The wisdom of such a procedure has been shown this season in several of the districts. Planting rains fell in the Dawson, Callide, and Upper Burnett Valleys around the 11th September. Those growers who had prepared their land in July and early in August were able to obtain a splendid strike on these rains. The recent series of storms will assure the development of the young plants in such crops, and will enable them to resist any periods of hot dry weather which may occur later.

Price Prospects.

Such an excellent start augurs well for those growers who have been able to obtain the early strikes. The indications are that the prices for this coming crop will be satisfactory, and will compare more than favourably with those which have been realised for the crop which has just been harvested. The Cotton Board has paid up to 4½d. per lb. for the top grades, and advise that it anticipates being able to pay at least another half-penny in the final bonus distribution. These prices have been obtained on a market in which the ruling values were of much lower average than appear probable for the coming crop. Recent cables state that the United States Government forecast for the American crop which is being harvested now, indicate a probable crop around 12,700,000 bales as compared to 17,000,000 bales for last season. The cause of such a marked reduction has been the recurrence of the boll weevil in such numbers in some sections as to destroy the greater part of the crop. If this forecast is realised, it means that the large carry over of cotton throughout the world's cotton markets will be diminished. This will tend to firm the prices and prevent such a disastrous drop as that which occurred in respect to the last crop.

The Cotton Board has intimated that it is making an effort to arrange so that a larger initial advance may be paid to the grower for the coming crop on the receipt of his cotton at the Ginnery. This, in conjunction with the excellent prospects for good prices, should make cotton-growing a very attractive proposition to those growers residing in the proved cotton-growing districts.

Demand for Queensland Cotton.

Recent advices indicate that the Australian demand for Queensland cotton will be considerably increased for the coming crop. This fact, in conjunction with the very opportune rains which have fallen this spring, make it appear that every cotton-grower should endeavour to plant the maximum acreage which he can grow properly. Seed applications indicate that the growers in the Central Queensland areas are following this practice, as marked increases in the individual growers' acreages are reported.

The occurrence of good rains recently over the area extending southwards from Gayndah should lead to a greater acreage being planted in the Southern districts. The indifferent results experienced during the last three seasons in these districts have checked the development of the industry to a great extent. These results have in a great measure been due to insect attacks on late-planted cotton.

COCCIDIOSIS OF CHICKENS.

P. RUMBALL, Poultry Expert.

Coccidiosis is probably the most destructive disease of chickens met with in Queensland. The disease, however, does not confine itself to this class of stock only, as adult birds are frequently affected in a chronic form, while well-developed pullets frequently go in the leg as the result of infection. With chickens from two to eight weeks, the disease assumes most serious proportions under favourable conditions.

The disease is caused by microscopic parasites, termed Eiméria Avium, which, when ingested by susceptible chickens rapidly develop and multiply in the walls of the intestines, and particularly the cæca or blind gut.

Symptoms.

The first indication of the disease is the tendency of chickens to bunch together, with closed eyes and drooping wings. On being disturbed they move about, apparently perfectly normal, with the exception that they appear to have exceptionally short backs. The tips of the wings, vents, and rear portions of the body are frequently stained with excreta. If an examination be made of the excreta of chickens, it will be usually found to be of a brick-red colour, due to the presence of blood. During the day or following morning some of the chickens will be found dead, and the number of shortened-backed, droopy-winged chickens added to. On opening up the chickens that have died, the upper portion of the small intestines is inflamed, and among its contents blood will be found. The inflammatory condition in chickens is usually more pronounced in the cæca, which is generally greatly distended and filled with blood, and in many cases the lining of the cæca will be found to have disappeared. Other organs are generally in a healthy condition.

The parasite responsible for this disease passes through many stages in its life cycle, the first being the egg stage. The egg of the organisms, known as an oöcyst, is voided from a diseased bird with the droppings. If again taken into the digestion tract of stock in that condition, no harm will result, but the conditions under which chickens are generally reared are such as to permit of sporulation, and when sporulated oöcyst gain an entrance to the digestion tract of susceptible chickens, a serious outbreak of disease is bound to result. When the sporulated oöcyst enters the intestines of the chicken another change takes place, and the parasite then commences to live upon the mucous lining of the intestine and cæca, undergoing several changes until the egg stage (oöcyst) is again ready to be voided with the droppings to undergo sporulation.

It is claimed by some authorities that the sporulated oöcyst will remain alive in the soil for a year or more; therefore, breeders who have been troubled with the disease should take precautionary measures to prevent its recurrence. It will also be readily understood how easily contamination can be spread from pen to pen by the organism adhering to the boots of the attendant, feeding, watering utensils, &c.

Treatment.

Medicinal treatment has been found to be of little use, therefore preventive methods should be adopted, and in outbreaks the worst cases destroyed. As the general stamina of the chickens is the best safeguard against serious infection, the arrangements for brooding purposes and the feeding of the chickens is of primary importance. Knowing that the first stage of the parasite—that is the egg or oöcyst before sporulation has taken place—is not harmful and that sporulation is only possible where there is sufficient dampness and warmth, brooding houses and runs should be as free from damp as possible. The congested condition under which chickens are reared naturally tends to foul the pens and brooders, and if the organism causing the disease is present, makes it a hotbed of infection; therefore, the thorough cleaning at frequent intervals is highly essential. The practice of scattering grain about the runs, highly desirable as a rule, should not be permitted when the disease is present, but grain and all food used should be fed in suitable receptacles that can be thoroughly cleansed once or twice a day.

The feeding of fresh skim milk and buttermilk powder have, to the writer's knowledge, checked outbreaks of the disease on various farms, but without the application of strict sanitary conditions, in conjunction with the milk feeding, very little good can be expected. If fresh skim milk is available, it can be used as the only form of a drink; whereas, with powdered buttermilk powder, it may be used

for a few days pure until the trouble is checked and then used to form a definite proportion of the dry mash mixture. Buttermilk not only has curative properties in connection with coccidiosis, but is a splendid feed for both laying and growing stock, and poultry raisers could well make this food form a portion of their standard mash rations. As a sole source of animal protein in a mash, it could be used to the extent of 10 per cent., but when troubled with coccidiosis, the ratio could be considerably increased for two to three weeks and then reduced to normal.

Both liquid milk and buttermilk powder have the effect of causing the droppings to become of a very liquid nature, and consequently frequent cleaning is necessary.

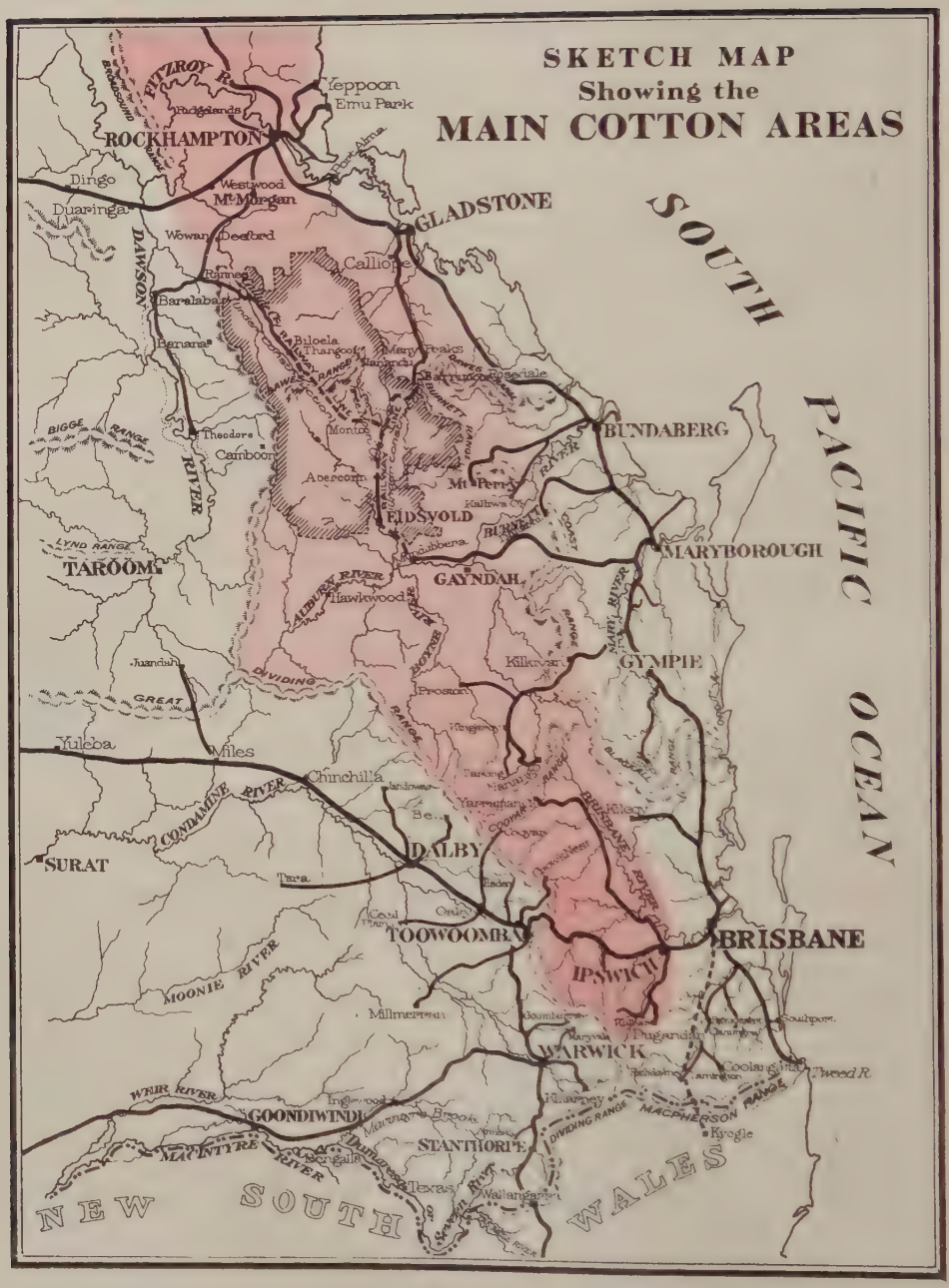
RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING SEPTEMBER, 1927 AND 1926, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of Years' Records.	Sept., 1927.	Sept., 1926.		Sept.	No. of Years' Records.	Sept., 1927.	Sept., 1926.
North Coast.					*South Coast*—continued:				
	In.		In.	In.		In.		In.	In.
Atherton	0·72	26	0·28	2·81	Nambour	2·56	31	6·97	7·36
Cairns	1·75	45	1·45	4·83	Nanango	1·91	45	0·54	2·25
Cardwell	1·60	55	1·37	12·19	Rockhampton ...	1·40	40	1·39	5·26
Cooktown	0·61	51	0·43	2·32	Woodford ...	2·21	40	5·20	3·90
Herberton	0·51	40	0·17	0·94					
Ingham	1·57	35	2·52	11·08					
Innisfail	3·76	46	1·70	13·15	*Darling Downs.*				
Mossman	1·67	14	1·14	6·25					
Townsville	0·86	56	1·07	4·60	Dalby	1·77	57	0·37	1·74
					Emu Vale ...	1·90	31	0·29	1·09
Central Coast.					Jimbour	1·60	39	0·68	1·77
					Miles	1·47	42	0·25	1·43
					Stanthorpe ...	2·40	54	0·51	0·73
Ayr	1·56	40	0·95	4·66	Toowoomba ...	2·23	55	1·49	3·20
Bowen	0·87	56	0·97	4·30	Warwick	1·88	62	0·61	1·25
Charters Towers ...	0·79	45	1·02	1·96					
Mackay	1·68	56	1·42	6·23					
Proserpine	2·35	24	2·42	8·14					
St. Lawrence ...	1·31	56	1·12	0·69	*Maranoa.*				
South Coast.					Roma	1·54	53	0·56	1·74
Biggenden	1·64	28	1·47	1·37					
Bundaberg	1·73	44	1·00	0·87	*State Farms, &c.*				
Brisbane	2·05	76	1·77	2·41					
Caboolture	1·92	40	3·15	2·75	Bungeworgorai ...	1·25	12	0·03	1·38
Childers	1·90	32	1·89	1·52	Gatton College ...	1·67	27	1·27	1·36
Crohamhurst ...	2·80	35	6·14	6·32	Gindie	1·13	27	0	1·57
Esk	2·25	40	1·60	3·13	Hermitage ...	1·68	20	0·68	1·24
Gayndah	1·58	56	3·13	1·82	Kairi	0·60	12	0·29	2·63
Gympie	2·17	57	2·41	3·72	Sugar Experiment Station, Mackay	1·48	29	2·17	5·39
Kilkivan	1·77	48	0·98	3·71					
Maryborough ...	1·99	55	2·09	3·50	Warren	0·76	12	1·25	2·10

NOTE.—The averages have been compiled from official data during the periods indicated; but the totals for September, this year, and for the same period of 1926, having been compiled from telegraphic reports, are subject to revision.

GEORGE G. BOND,
Divisional Meteorologist.


SKETCH MAP
Showing the
MAIN COTTON AREAS
SOUTH PACIFIC OCEAN
NEW SOUTH WALES
ROCKHAMPTON
GLADSTONE
BUNDABERG
MARYBOROUGH
GYMPIE
BRISBANE
IPSWICH
TOOWOOMBA
DALBY
WARWICK
STANTHORPE
GOONDIWINDI
TAROOM
MILES
SURAT
CHINCHILLA
GAYNDAH
KILKIVAN
KINGAROY
NANANGO
MURGON
YEPPOON
EMU PARK
CALLIOPE
BANANA
THEODORE
CAMBOON
MONTO
MT PERRY
BURNETT
DAWSON
FITZROY R.
BIGGE RANGE
LYND RANGE
DIVIDING RANGE
GREAT DIVIDING RANGE
MACPHERSON RANGE
CONDAMINE RIVER
MOONIE RIVER
WEIR RIVER
MACINTYRE RIVER
BRISBANE RIVER
MARY RIVER
BURNETT RIVER
Tweed R.

COTTON GROWING IN QUEENSLAND.

PART I.

Cotton Cultivation.

By W. G. WELLS, Cotton Specialist.

THE history of the initial stages of the development of the cotton-growing industry in Queensland has been described in former papers on this subject.[1] It is proposed in this bulletin to discuss the more important phases of the cultivation of the cotton crop, the insect pests which attack it, the methods of controlling them, and the present status of the industry.

During the period of the existence of the Commonwealth and Queensland Governments' system of guaranteed advances on seed cotton which expired at the end of the 1925-1926 crop, a great portion of the agricultural sections of this State was tested as to the suitability for growing cotton. As was to be expected with a comparatively new industry, many of the tests were made on unsuitable soils or in areas of adverse climatic conditions. The general results secured, however, from these experimental plantings, both by co-operators with the Department of Agriculture and individual farmers, have been of inestimable value in determining what districts are the most suitable for producing profitable crops.

It may be said then that the industry has passed through the investigational stages in this respect, and that the areas in which the cotton crop will return profitable yields have been fairly well ascertained. Generally speaking, they lie along the slopes and medium alluvial loamy flats of the valleys of the eastern watershed of the Great Dividing Range, from north of Beaudesert in the south to the Fitzroy River and areas adjacent in the north, and lying in behind the coastal ranges from Brisbane to Gladstone and thence north to Rockhampton. This covers an area of some 400 miles long by 50 to 150 miles wide.

The accompanying map roughly shows the areas.

CLIMATE.

Temperature.

The climate through most of the Cotton Belt may be described as normally suitable for the production of heavy-yielding crops of cotton. The period usually free from frosts, with the exception of a

[1] Cotton Cultivation: H. C. Quodling; Bulletin, Department of Agriculture and Stock, 1922. Cotton Cultivation: W. G. Wells; Bulletin, Department of Agriculture and Stock, 1923.

few small areas, commences during the first half of September and extends until at least the end of April. Light frosts may be experienced at this stage in some seasons, especially in the inland areas occurring at altitudes of 400 to 600 ft. or higher above sea-level. Frequently no frosts are experienced before the middle of June over the whole of the belt, so it can be seen that a long growing period usually exists.

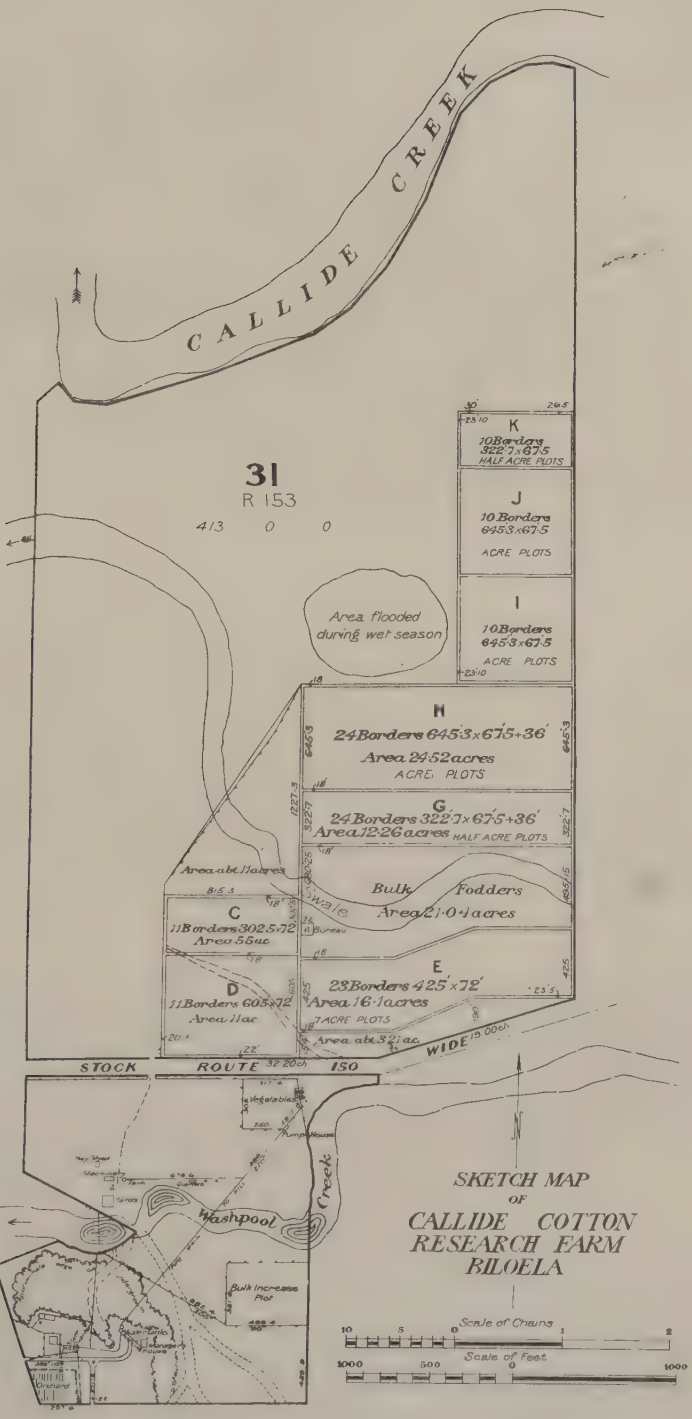
The daily temperatures during the growing period range from a minimum of 45 to 55 and a maximum of 75 to 80 in the spring, to a minimum of 60 to 75 and a maximum of 85 to 100 in midsummer with an occasional day over 100. During the higher temperatures there is usually a low amount of humidity, so that, while hot, no excessive discomfort is felt. These temperatures cover the average of the belt, although in some of the areas of the higher elevations the figures will be lower throughout the season, especially at night. During the harvesting season the maximum temperatures lessen rapidly so that the bulk of the crop is picked normally in delightful weather.

Rainfall.

Sufficient rainfall generally occurs during the latter half of June and in July to enable well-prepared seed-beds to be established if the operations are performed at the proper time. August usually is dry until near the end of the month, when scattered to even general rains normally are experienced over most of the Cotton Belt. These precipitations of a scattered nature may continue through the early half of September, but after that period only isolated storms can be expected until November, when a series of thunderstorms usually occurs in nearly all of the districts. The main summer rains normally commence in December and continue at varying intervals through January, February, and the first part of March. From then on until June a period of clear hot weather in the day and gradually increasingly cooler nights ordinarily exists, which provides a nearly perfect harvesting season. This is shown by the high percentage of the top grades which are obtained, fully 75 per cent. of the crop usually being of the World's Universal Standard grade of Strict Middling or better, with a large amount equalling the grade of Strict Good Middling cotton.

The average total yearly rainfall varies somewhat in the different districts, but may be described as ranging from 22 to 35 in., with the greater portion of the belt receiving about 28 to 30 in. Unfortunately these amounts may include falls occurring during storms of a tropical nature when 4 or 5 in. may fall in two or three hours, in which case little benefit may be received.

The record for 1925-26 at the Callide Cotton Research Station is included as an illustration of the nature of the distribution of the rainfall which may be experienced over many of the cotton belts.


CALLIDE CREEK
31
R 153
413 0 0
Area flooded during wet season
K
10 Borders 322·7 x 67·5
HALF ACRE PLOTS
J
10 Borders 645·3 x 67·5
ACRE PLOTS
I
10 Borders 645·3 x 67·5
ACRE PLOTS
H
24 Borders 645·3 x 67·5 + 36'
Area 24·52 acres
ACRE PLOTS
G
24 Borders 322·7 x 67·5 + 36'
Area 12·26 acres HALF ACRE PLOTS
Area abt. 11 acres
Bulk Fodders
Area 2·1·0·4 acres
C
11 Borders 302·5 x 72
Area 5·6 ac
D
11 Borders 605 x 72
Area 1 ac
E
23 Borders 425' x 72'
Area 16·1 acres
7 ACRE PLOTS
Area abt. 3·2 ac
STOCK ROUTE
WIDE
Vegetables
Pump House
Creek
Washpool
Bulk Increase Plot
SKETCH MAP
OF
CALLIDE COTTON
RESEARCH FARM
BILOELA
Scale of Chains
Scale of Feet

DAILY RAINFALL, CALLIDE RESEARCH FARM, 1st JULY, 1925, TO 30th JUNE, 1926.

Day.	July.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	..	..	..	..	..	36	267	..	..	..	..	2
2	..	..	..	..	..	..	3	..	..	..	..	..
3	..	..	..	..	4	11	60	..	..	..	..	..
4	25	..	..	..	..	..	24	..	..	..	..	..
5	..	..	18	..	75	11	..	..	..	..	..	..
6	..	..	..	..	..	..	169	..	..	4	..	..
7	..	..	..	..	..	..	9	..	..	..	..	79
8	..	..	..	..	..	..	455	..	..	..	..	..
9	..	..	..	..	141	..	..	..	..	..	..	..
10	..	..	..	18	4	..	..	457	33	..	..	..
11	58	..	..	..	..	..	..	86	36	..	2	..
12	..	..	..	..	..	..	..	37	..	5	13	..
13	..	..	..	..	..	..	..	68	..	..	2	..
14	..	..	..	..	6	..	..	..	..	..	..	..
15	..	..	..	..	..	96	..	..	..	6	6	..
16	..	..	137	..	..	35	..	..	..	..	6	..
17	..	..	52	..	..	..	9	..	..	..	195	..
18	..	..	..	..	..	..	14	..	..	..	..	..
19	..	..	..	..	..	..	..	..	..	..	..	..
20	..	..	..	..	..	..	9	..	..	..	..	2
21	..	..	..	..	..	..	..	..	..	..	..	..
22	..	..	..	..	54	..	..	..	..	..	..	..
23	..	..	..	..	..	..	..	..	..	..	..	..
24	..	..	5	..	..	135	..	..	..	..	..	65
25	..	..	..	..	..	..	..	65	..	..	..	15
26	13	..	..	..	..	..	..	..	..	..	..	..
27	..	..	..	..	..	..	..	..	..	..	..	..
28	..	..	..	..	..	..	..	..	..	..	..	..
29	..	29	..	..	..	..	..	..	..	..	..	..
30	..	10	..	..	..	22	..	..	..	..	..	..
31	..	..	..	..	..	47	..	..	..	..	40	..
Monthly Total ..	96	39	212	18	284	393	1,019	713	69	15	264	163

Yearly total—32·85 inches.

SOILS.

The cotton plant appears to be able to adapt itself to a wide range of soils, but the experiences of the farmers of Queensland during the last five years seem to indicate that certain soils are far more suitable than others. It must be remembered that climatic conditions play an important part in deciding the suitability of a soil for the producing of a heavily laden cotton plant. The time of planting of the crop is also a deciding influence.

Suitable Soils.

Given a moist subsoil, an early-planted crop of cotton may produce a very profitable yield with the proper climatic conditions, on several classes of the soils found in the Cotton Belt of Queensland. These include the rich alluvial creek loams; the grey and the brown scrub soils; the sandy loamy slopes and ridges with a clay subsoil and which originally were covered with a combination of the narrow-leaf ironbark, the Moreton Bay ash, and good-sized bloodwood trees; the brown forest soils; and the apple-tree sandy-creek flats.

It is when some of the necessary factors are absent that difficulties in obtaining profitable yields are encountered. Generally speaking, it may be safe to assume, when the crops are planted late, that in districts which are liable to receive heavy rains in January and February it is wise not to plant on soils that do not have a good drainage or which are of exceptionally rich fertility. The difficulty with late-planted cotton is to have the plants sufficiently laden to control the growth on fertile soils under luxuriant growing conditions. The general experience has been that the gravelly loamy slopes are better suited for such crops, as the plant makes a slower, stockier growth with a consequent heavier setting of fruit. In the Callide Valley, the clayey loamy soils occurring at the junctioning of the loams and the box-tree clay flats appear also to be well suited for late-planted cotton. Such a plant is not so likely to develop an excessive vegetative growth at the expense of the crop of fruit when excessive rainfall occurs. As early planting rains do not always occur in some areas, it can be seen that this is a very important factor, and one that every farmer should investigate on his own place in order to know what to do when such conditions arise.

Unsuitable Soils.

The consensus of opinion of most farmers who have experimented with growing cotton on the heavy black soils of the creek flats, such as in the bottom of the Lockyer Valley and in districts of similar nature, is that they are not suitable for cotton culture unless under exceptionally favourable conditions. Where good winter rains have fallen on an early prepared seed-bed, so as to put ample moisture in the subsoils, heavy yields from early-planted crops may be secured. The great difficulty with such soils is that they are difficult to cultivate during periods of showery weather after the crop is up. The pigweeds, convolvulus, and various other weeds difficult to eradicate by machinery when once established, particularly infest these classes of soils, and if the cotton crop is planted late the control of the weed growth often becomes a very expensive item.

The red softwood scrub soils have as a whole proved to be unsuitable for cotton production over any length of time. Analyses of such soils have nearly all shown that they are lacking in phosphates or potash and sometimes both. The usual results obtained from such soils have been good or even excellent crops the first two years after the scrub has been burned, but where cotton crops have been planted on old cultivated paddocks of these soils the results often have been extremely unprofitable.

SIZE OF COTTON AREAS.

Although the area marked on the enclosed map indicates that a large section of country is suitable for cotton-growing, only a small portion of it actually has been in cotton. During the years 1921-26 inclusive, the maximum area harvested in any one year was approximately 40,000 acres. The tendency of many of the growers has been to limit their acreage

to such as they can cultivate without employing labour other than that necessary to harvest the portion of the crop which the grower and his family could not pick. Under such a system the average cotton plot in the older settled areas has varied from 5 to 15 acres, with the majority around 10 acres. In the newer areas, especially in the sections some distance from butter factories or markets for farm products, the acreages have varied from 20 to 100 acres, as the grower has concentrated his labour on cotton-growing. It is believed, as the farmer becomes more familiar with cotton-growing, and sees the advantage of using machinery which will effect the most economy in labour, that the individual acreage will increase in size. This enlargement of the individual acreage is desirable, as it not only decreases the cost of production but increases the chances of improving the uniformity of the bale of lint. The growers of the larger acreages send in more cotton in the one consignment, which enables the ginning to be performed with the least amount of mixing of styles of fibres. This also tends to decrease the cost of overhead expense in the various activities at the ginnery, and should be practised wherever possible.

It is not considered advisable to grow only cotton unless the problem of marketing eliminates other crops. Nearly all of the areas where cotton is being successfully grown can grow other agricultural products which may be utilised in dairying, pig-raising, &c. Where cotton-growing is combined with such industries, it may be considered an excellent cash crop which fits into nearly every rotation which can be practised to advantage. This feature makes it appear that every farmer in the areas where cotton can be grown profitably should include this crop in his regular plan of operations. Over a series of years it is believed that the returns per acre received from it will compare favourably with the other crops that can be grown in the ordinary agricultural areas of the State.

FARM EQUIPMENT.

A large percentage of the cotton-growers was already established on farms in the agricultural districts before the increased interest in cotton-growing occurred in 1921-22. In many cases the farms were equipped with only walking scufflers, single-row planters, and such machinery which the usual small "mixed farming" type of place would have. The farmers naturally have endeavoured to grow the cotton crop with this equipment. On some lands these implements, with some modifications, have been about as suitable as could be used, especially on the slopes or in small irregular plots. Where the land is suitable to the use of riding cultivators and two-row planters, it is believed that the greater efficiency of these machines justifies their purchase. In order to reduce the cost of interest and depreciation per acre and also to obtain the full benefit of the efficiency of these implements, it is necessary that the grower should have at least 15 to 20 acres of cotton. It should be realised that such equipment is suitable also to the cultivation of the other ordinary farm crops that the average cotton-grower can grow, and the use of it reduces the expense on such crops as well.

Reducing the cost of production is an important problem in cotton-growing in Queensland, and every device which can effect this result should be utilised. Labour-saving machinery can be employed to great advantage on the average cotton farm of this State. One man with a one-horse scuffler can cultivate an average of approximately 3½ to 4 acres a day, whereas with a two-horse riding cultivator he can cultivate up to 7 acres a day and do better work as well. A double saving is effected in the one operation with the riding cultivator, in that more area is covered per man per day and the points of the riding machine can be set close to the row, which enables the destroying of more weed growth than where the one-row scuffler is used. In this respect it is preferable to use a pivot or driver steered machine to one of the rigid tongue type, with which the steering is done by directing the horses. Unless the team is evenly gaited and used to such work, it is exceedingly difficult to steer the implement when the inner points are set close enough to remove weed growth near the plants. With a machine which is steered by the driver, excellent work can be performed within a few inches of the plants without the slightest damage to them. Several types of these machines are on the market in this State now, and the growers should use them.

The use of the two-row split-wheel type of combination maize and cotton planter is also of decided advantage. A man with a one-horse single-row planter can plant from 4 to 6 acres a day, whereas with a two-horse two-row planter he can plant 10 to 14 acres a day depending on the speed of his horses and the length of the rows.

This is of marked advantage in districts where the spring rains are somewhat precarious. Frequently planting has to be done following a fall of 50 to 60 points of rain. Speed is a big factor in the success of the operation under such conditions, and the quicker performed the more likelihood of success, especially under the windy conditions which often prevail at planting time.

Another decided advantage obtained by the use of this type of planter is that the planting is effected more uniformly than with some of the combination planter-cultivators on the market. Having the planting spouts with disc openers just ahead of the wheels tends to insure the spout and the press-wheel being more in the same plane than where the spout is some distance from the wheel, as in the other types mentioned. The split-wheel appears to be of the utmost importance where planting is effected following a storm of some 50 or 60 points of rain. The packing action of the rims of the wheel on the sides of the seed rather than on the top insures the seed being in firm moist soil and at the same time leaves a loose mulch on top to prevent evaporation. As the weight of the machine and the driver is borne by the rims which press the soil against the sides of the seed, it can be seen that a decided firming of the seed-bed directly under the seed is also accomplished, which assists in making contact with the moisture of the subsoils.

Where the acreage to be planted is too small to warrant the purchase of a two-row machine, the grower may secure very good results with some of the single-row split-wheel planters. These machines utilise the same principle of covering the seed, but may be somewhat light for obtaining the same pressing effect around the seed. This can be effected by carrying a partly filled sack of seed on the back part of the frame.

PREPARATION OF THE SEED-BED.

The uncertainty of the winter rains is the most disturbing factor in the growing of cotton in Queensland. In some seasons they are very light, and, unless the seed-bed is prepared early so as to receive the full benefit of such rains, difficulty may be experienced in maintaining a stand during the dry, windy period of October, owing to the lack of subsoil moisture. The initial stage of the development of the young plant usually occurs in this month, and, unless there is sufficient moisture to enable the developing tap-root to supply the tender plant's requirements, serious losses may be experienced. Early, properly prepared seed-beds can discount this factor to a great degree, however, as has been demonstrated by large numbers of farmers who have obtained good strikes every season and at the Callide Cotton Research Station, where very little difficulty is ever experienced in this respect. Nevertheless it is a serious problem, and the cotton-grower should recognise it as such and endeavour to prepare the seed-bed at the earliest possible period in order to take full advantage of any winter rains which may occur.

Where the new crop is to be planted on land which is in cotton, it is believed that greater benefit is to be obtained by cutting down the plants by the middle of July at the latest. There may be a fair top crop of green bolls on the plants at that time, but investigations over the last few years have shown that a considerable proportion of these bolls contain stained cotton caused by fungus diseases in conjunction with attacks of the sucking insects (*Dysdercus sidæ* and *Tectacoris lineola*). Attacks by the peach moth grub (*Conogethes punctiferalis*) and the pink boll-worm (*Platyedra gossypiella*) also may destroy a considerable percentage of these late bolls, so that the grower will often be disappointed in the amount of good cotton which he obtains from what appears to be a fair top crop of bolls.

Where the grower has a dairy the cows may be turned into the field after the last picking, so that they can feed on the green bolls and squares and thus destroy any insect life which may be present in them. When this is completed, the stalks should be cut and burned as soon as sufficiently dry.

The cutting of the stalks can best be effected by means of a slide with knives on each side. This machine, which is similar to the maize slide-cutter, can be made on the farm, and requires but two worn-out crosscut saws. These are ground to a knife edge, and holes bored through which to bolt the blades to the slide.

The ploughing of the land should be performed as soon as possible after the burning of the stalks. In some districts the soil may be exceedingly dry and hard, but it is believed that the ploughing should be done as soon as the crop is cleared off, so that the full benefit of any rains falling during July may be obtained. In case the soil breaks up very cloddy, an efficient roller can be made of a tree-trunk with iron spindles and a frame set upon these.

Depth and Number of Ploughings.

There appears to be a diversity of opinion in regard to the depth and the number of times of ploughing. Some growers contend that one ploughing is sufficient, and in this school of thought the recommended depth may range from 6 to 12 inches; the advocates of the deeper ploughings maintaining that a deeply ploughed soil offers more opportunity of storing moisture for the plant's requirements later in the season. This might be true if the winter months usually received sufficient rainfall to moisten the ploughed bed to the subsoil. Unfortunately most of the Cotton Belt does not receive such rain, and the deeper the ploughing, if made in the winter, the greater may be the width of a dry zone of loose earth overlying the subsoil at planting time. Other growers maintain that two ploughings are necessary to thoroughly prepare a proper seed-bed. This may be so where the land is grassy, when a shallow ploughing will be required at first to expose the roots and then later a deep ploughing to turn everything under. For ordinary conditions it is believed that two ploughings are not necessary and the amount of labour expended would be better utilised in harrowing and sometimes rolling to firm the seed-bed.

From results obtained at the Callide Cotton Research Station on alluvial clayey loams, it appears that one ploughing of 6 or 7 inches in depth is all that is required on old cotton land. The land is then rolled to firm it and break up any large clods, and then harrowed so as to leave a deep mulch. Harrowing is performed after all rains, and by planting time the seed-bed is generally of a firm, compact nature underneath but with a decided springy feeling on top to one walking over it. Fifty points of soft rain will give a splendid strike on such a soil, as only a shallow harrowing is made after the planting rain, with a lever harrow with the teeth set back at a fair angle. This leaves a nice mulch on top and yet does not stir up the seed-bed under the surface.

Where the land is trashy or weedy to such an extent that it appears desirable to plough twice, it is suggested that the last ploughing should be made at least a month ahead of planting time. This allows the soil to settle and firm the seed-bed. From observations made in various districts, it is believed that a great deal of damage is done each season in the Cotton Belt by late cross-ploughing. Cases have been observed where such ploughing was being performed from which the only result to be obtained was the loss of what moisture there was in the surface

soil. With as scant a winter rainfall as has most of the Cotton Belt, it appears only reasonable to believe that the less the lower soils of the seed-bed are disturbed after the first ploughing, the firmer the seed-bed will become. Numerous examples have been noted where planting has been made following 50 to 60 points of rain falling on a late prepared, loose seed-bed. The seed germinated and grew well where subsequent rains wet up the lower soils, but where droughty conditions prevailed the young roots soon penetrated to the dry layer of loose soil lying on the subsoil, and the strike was badly depleted during periods of hot, burning winds which occurred in late October and early November. In the same district and on similar soils which had been prepared in the manner which has just been suggested, not only were excellent stands maintained through such periods, but the young plants made splendid progress, which showed that they quickly penetrated through the firm seed-bed into the moist subsoils.

PLANTING.

Methods.

As has been pointed out, planting operations can best be performed by the split-wheel type of planter equipped with disc-openers on the seed-spouts. On the Cotton Research Station excellent strikes have been obtained each season with this type of machine while farmers in the same district have only been partially successful with other types of machines, or where good strikes have been secured, have experienced the dying out of sufficient plants during periods of hot dry weather to affect materially the ultimate stand. It is believed that the pressing of the loose soil around the seed firms it to such an extent as to enable the lower moisture to rise to around the seed, and thereby assist in the development of the root system of the young seedling in the early stages.

Nearly all other types of planters lack this feature, as the seed is usually dropped in a shallow furrow made by single or double disc-openers and then covered by means of scrapers. The weakness of such a system can be seen in that there is no firming of the soil around the seed, and therefore no aid to assist the movement of the ground moisture.

In some of the districts where the individual acreage of cotton is generally so small as not to warrant the purchasing of a cotton planter, the custom is to plough out shallow furrows with a single-furrow plough and then drop the seed by hand in the bottom of the furrow. The seeds are then covered by means of a one-horse scuffler with the frame closed up so that the teeth work in the moist soil on the sides of the furrow. This method gives good results if the soil is well moistened and the covering is made at a uniform depth. It is believed that the best results will be secured if the scuffler has a wheel attachment in front running on top of the seed. This presses them on to the firm, moist soil below and also assists the operator in covering at a more uniform depth. The

main feature of this method is that the planting and covering should be done immediately behind the ploughing of the furrow in order to avoid loss of moisture.

A modification of this system is used where the winter rains have not occurred. The furrows are ploughed in the dry seed-bed and left open for the fall of the planting rains. Upon the occurrence of these, the seed are distributed along the bottom of the furrow and then covered by means of the one-row scuffler. This leaves a shallow depression where the row is, and it may be that this is of advantage in a dry windy spring, as some protection may be afforded from the winds.

Another method of planting frequently used by the farmers in the drier areas is to plant the seed in a dry seed-bed, with the idea that a strike will be obtained in case of only light falls of rain occurring. This may be a wise procedure where a farmer is growing large areas and has a limited amount of labour with which to effect the planting. In such circumstances, by planting dry he is assured of obtaining the full benefit of a light storm. However, there are dangers associated with this system which should be considered. In the first place, a fall of 20 or 30 points of rain usually means that the seeds start swelling and then, owing to the drying out of such a small amount of moisture, further development ceases with a consequent rotting of the seed. Another feature is that if a germination is secured with a light rain there is danger of a considerable loss of stand occurring unless rain falls soon after the seedlings appear above ground, owing to the lack of moisture underneath prohibiting the development of a proper root system. In such a case the chances are that, if part of the stand has been lost before the necessary rain comes, the grower will be inclined to carry on with the plot, and therefore be handicapped all season from obtaining the full possibilities of his soil. Under the best of conditions this method is a gamble, and it is believed that if more attention is paid to the early preparation of the seed-bed it will not have to be resorted to.

Depth of Planting.

In all probability more loss occurs in the cotton-growing industry in Queensland through the lack of proper stands than by any other cultural factor. Without a full stand the grower cannot receive the proper benefits of his labours, no matter how skilful a grower he may be. It therefore is most important that every effort should be made to obtain as near a perfect strike as possible.

One of the main causes of failure in securing a proper strike is the incorrect depth of planting. In average soils and under the climatic conditions which usually exist in Queensland at cotton-planting time, sound seed covered to a depth of 1½ inches in a moist, well-prepared seed-bed should give an excellent strike unless heavy crusting rains occur before the seedlings come through the surface. When such storms occur it is advisable usually to harrow the land thoroughly and replant rather than wait for the first planting to come through.

Examinations of scores of fields where irregular germination was occurring have shown that it is very seldom that the seed is at fault, but that the depth of planting has been non-uniform. The result has been a series of gaps in the rows, of variable distances in length. In most cases where the seed-bed had been well prepared the fault has been too deep a covering, as shown by the young seedlings having died just before the seed-leaves pushed through the surface. A cotton seedling is only capable of pushing up through a certain depth of soil, and will die unless it gets through this soil in the proper time, even if fully developed. Frequently very pale, yellowish green, small-leafed seedlings may be seen in rows which have been covered by some form of scrapers to ridge the soil over the seed. Examination often shows that these seedlings are of exceptional length between the top lateral roots and the seed-leaves, which indicates that the seed was at too great a depth under the surface.

Generally speaking, the depth of covering is usually too great, especially in the early plantings. In nearly every field one can see instances where the seed which spilled out of the hoppers at the ends of the rows has been the first to germinate. This affords an excellent illustration of the results to be obtained by shallow planting in a firm soil, and should be ample evidence of the necessity for the preparation of the seed-bed so as to approach similar conditions.

Seed Rate of Planting.

The average grower does not plant enough seed to insure that a good strike will be secured. This has been brought about by several factors, all of which are non-operative at present with the main supply of seed, and the practice should be discontinued in favour of heavier planting rates. When the increased interest in cotton-growing first assumed considerable proportions, it was necessary to restrict the planting rate owing to the limited amount of seed. This condition was improved somewhat in later years, but with the development of the Durango variety it was necessary to decrease the planting rate from 12 and 15 lb. to 10 lb. of seed per acre owing to the limited amount of seed.

The growers, under favourable planting conditions, were able to obtain good commercial strikes with such planting rates. This, in conjunction with the fact that they were learning the necessity of spacing the plants farther apart in the thinning operations, and thereby necessitating the removal of large quantities of plants, caused the growers to think that 10 to 12 lb. was a sufficient rate of planting. Under suitable climatic, soil, and cultural conditions a good strike may be obtained with this planting rate, but the absence of any of these factors may affect the germination to such an extent as to prevent the grower from obtaining the full returns which his soils are capable of producing.

The experiences of the Government Experimental Stations have been that, while under favourable conditions a good strike may be obtained from a planting rate of 10 lb., it is of decided advantage to

plant 20 lb. per acre. The extra amount of seed insures that a strike will be obtained which will enable nearly a perfect stand to be left in the thinning operations. This is especially true where heavy storms occur just before the seedlings push through the surface. The larger amount of seed gives the necessary thrusting power to break any crust which may form, whereas with the lower planting rate it is only where there are bunches that there is sufficient power to push through in case of a crust forming.

A planting rate of 20 lb. of seed to the acre gives a strike which may seem to be entirely unnecessary and which will entail considerable work in the thinning operation. It is believed, however, that it is far better to have such a strike which requires considerable thinning and allows a perfect spacing of the plants, than to have a patchy stand which requires but a small amount of work at thinning and does not return the maximum yields through lack of the proper number of plants. It has been found that in some seasons cotton seed is badly damaged by sucking bugs, and when used for planting the following season germination is poor. (*See* Part II., plate VI.) This also adds to the necessity for a heavy planting rate.

Time of Planting.

The consensus of opinion amongst the growers and the results secured in experiments on the Experimental Farms all seem to agree that early planting is desirable. By early planting it is meant that planting should be done following the first rains falling after the soil has warmed sufficiently to maintain a growth of the seedlings, and that usually there will be no danger of frosts being experienced. In most of the cotton areas of Queensland this condition generally occurs by the middle of September, although in a few of the inland areas of some altitude the end of the month may be more suitable. Planting can continue on until the end of the first week in November if the moisture conditions are favourable, and good yields may be secured. After this period the yields decline rather rapidly with the later planted crops. This is especially so in the inland areas, as shown by the time of planting experiments at the Government Experiment Stations in the season of 1924-25.

Yield of Good-quality Seed Cotton per Acre.

	Planting in—				
	September.	October.	November.	December.	January.
	lb.	lb.	lb.	lb.	lb.
Monal Creek Demonstration Area	2,184	1,543	1,120	Not mature	Not mature
Callide Cotton Research Station	..	912	885	220	Not mature
Callide Cotton Research Station, 1925-26	..	..	933	116	..

In the regions where frosts do not occur until July or August and then of only a light intensity, December plantings may yield satisfactory returns, but they rarely compare with those obtained from the earlier plantings.

The reasons for the earlier plantings yielding better than the later ones appear to be that the plants of the September and October plantings make a slow growth until the December rains begin. Apparently the cool nights which usually occur during this period of the year and the dry weather of October and November tend to restrict the development of the plant so much that it becomes of a toughened woody nature rather than of a succulent one. An excellent tap-root is developed as well, which enables the plant to withstand periods of drought later in the season. The plant develops a fruiting rather than a vegetative system under such conditions, and the December rains seem to stimulate the growth of the fruiting structure more than a tendency to vegetative development, even under the occurrence of fairly heavy rainfall. Apparently, once having developed this form of structure, very unusual conditions are necessary to affect it, and, while heavy rainfall may cause the development of a large plant, there is a corresponding amount of fruit borne, so that the larger plant really means a greater crop of bolls.

This feature does not hold true with the late-planted cotton. Usually only a short period of growth occurs before the beginning of the December rains. Consequently the plants are of a semi-succulent nature and the occurrence of the rains intensifies this condition. The result is a rapid growth of an elongated nature both in the main stalk and in the fruiting branches. A vigorous development of vegetative branches usually occurs, which is detrimental to any lower crop of bolls which may be present, owing to the excessive shade which is caused by the increased number of vegetative branches and the size of the leaves thereon. Unless a plant of such nature receives a very severe check by drought it is extremely unlikely that any but a very late top crop will be realised.

Such plants are also more subject to attack by such insects as the corn ear worm (*Heliothis obsoleta*). This insect apparently prefers the young squares of the late-planted crop to that of the earlier-planted cotton. As the appearance of the heaviest emergence of the grub of this insect occurs at the most critical stage in the development of the late-planted cotton, i.e., around the middle of January, it can be seen that an added danger lies in growing such a crop.

The season of 1926-27 has given some results in late-planted cotton which may be of decided value. In this season most of the growers in the Callide and the Dawson Valleys could not obtain stands of cotton until the middle of December. Ordinarily crops planted in this period of the season would have returned very little yield. Such was the case in crops planted on alluvial soils—that of the Callide Research Farm yielding practically nothing. The growers who planted on the

clayey loamy soils, where the box-tree clay flats and the alluvial loams intermingle, obtained as much as 700 lb. of cotton to the acre. The explanation seems to lie in the fact that such heavy rains fell in January that the pores of the soil became waterlogged, thus causing a "physiological drought" effect on the plants. The result was a decided checking of the growth of the plants, and after a two weeks' heat wave in February the resumption of heavy rains produced a very good crop of cotton rather than a rank vegetative growth as might have been expected. This phenomenon should be borne in mind, and all growers should experiment under as nearly comparable soil conditions as possible in case a similar situation arises again.

Spacing of Rows.

There is no definite data from which to determine the correct distance to space the rows. In the earlier crops of the period from 1919 on, the general practice was to plant the rows 4 ft. apart. The experiences of the growers were that on most soils this distance was somewhat unreliable. In seasons when heavy rains fell during December and January, such a rank growth of plant was liable to develop that the space between the rows was entirely grown over. The sunlight under such conditions could not penetrate through the luxuriant foliage sufficiently to prevent excessive humidity existing around the lower portions of the plants. The result was severe losses of the lower crop due to external boll-rots.

In an attempt to overcome this condition, the space between the rows was widened to various distances varying from 4 ft. 3 in. to 6 ft. A majority of the growers have decided finally that 4½ ft. seems to be the most suitable for average conditions, and the bulk of the crop is planted accordingly with such spacing. The yields obtained and the quality of the cotton produced indicate that this space for the average conditions of the Cotton Belt may be relied upon ordinarily to give good results, other factors being normal.

It may be that certain soils will require different spacing. A method is being investigated at the Callide Cotton Research Station in which the "outside row effect" is incorporated. Usually the outside rows of a plot of cotton yield heavier than do the inside rows. In the United States, this factor has been recognised and has been obtained throughout the field by means of planting the rows in pairs in which the distance between the two rows of a pair is somewhat less than that between the pairs. The use of this method has been found to be of advantage in controlling the growth in irrigated cotton fields where boll-rots may cause serious losses.

Such a system may be of advantage on some of the rich alluvial soils of Queensland in districts where heavy rainfall may occur in January or February. Experiments are being conducted along these lines using distances of 4½ ft. between the two rows of a pair and 5½ or 6½ ft. between the pairs. No uniform results have been obtained to

show that there is any advantage to be gained by such spacing. It is suggested that the growers who have soil and climatic conditions where this method may be of advantage should experiment along such lines in order to determine the value of such for their particular soils.

CULTIVATION.

The operation of cultivating a cotton field does not receive always the amount of attention that should be given to it. This is not an expensive operation if properly done, yet the number of times that a cotton crop has to be cultivated in a season makes it necessary that each cultivation should be as efficient as it is possible to attain. One frequently sees machines equipped with the wrong points or ones requiring sharpening, &c. Attention to such details often reduces the cost of production to a marked degree, and it is stressed that the grower should study his machine and see if it is properly equipped before using it.

The most efficient cultivation can be obtained with the riding two-horse cultivator which is steered by the driver. In such an implement the carriage on which the points are fastened works independently of the main structure of the machine. Instead of controlling the carriage by directing the horses, the steering is done directly by the driver in conjunction with the horses, through control of the wheels or of the carriage itself. There are several types of this form of cultivator on the market, and the growers should investigate them and see the advantages to be obtained by using them.

Usually such machines are adaptable to the use of disc attachments, hillers, duck feet, or sweeps of various sizes and the ordinary tines. All of these points, with the possible exception of the discs, are required in the average field of cotton, and to attempt to cultivate a crop without them usually means that at some stage in the operations an inefficient cultivation is made. These points can be used on the one-horse scuffler as well and to some extent on the combination planter-cultivators, but neither of these machines, of which there are several types, allows the careful work close to the plant that the above-mentioned type of cultivator will do.

It is the degree of efficiency with which the cultivation close to the plants is made that controls the amount of hand labour that has to be used in growing a crop of cotton. Where the inner points of a machine cannot be put close enough to destroy most of the weed growth around the plants, an extra charge is incurred through the necessity of employing hoe labour to perform the same. As an acre a day is average hoeing, it can be seen that such inefficiency in the cultivation is decidedly expensive. This is especially so in seasons where showery conditions exist in the early part of November, when the plants may not be tall enough to withstand very much soil being worked to them.

The first cultivation should be made soon after the row of young plants is discernible, as this creates a mulch around them and also destroys any young weed growth which may be forming. Usually

this is all that is necessary until the thinning is performed, when another cultivation should be given to work back to the plants the soil which may have been removed in the thinning operations. From this point on, only sufficient cultivation to keep down weed growth and provide ample mulch to maintain moisture is required. Generally speaking, four or five more cultivations will be required after this before the last cultivation, when the crop is "laid by" with the riding cultivator. In each operation the soil should be worked to the plants so as to form a good mulch around them and also to smother out any weed growth which may be developing in the row. At the last cultivation the soil should be well ridged around the plants, so as to brace them against the force of any storms which might occur later in the season when the plants are heavily laden.

Cultural methods used at the Cotton Research Farm seem to indicate that it is advisable to continue the cultivation between the rows until late in the season. For this purpose a one-horse scuffler, equipped with long traces and a short spreader behind the horse, is used. Hessian is wrapped around the ends of the spreader so as to prevent catching and breaking of the branches. This cultivating assists in preventing any weed growth from developing in the "middles" and also maintains a moisture-retaining mulch during the period when the upper crop of bolls is developing. It is believed that this extra cultivation, especially in droughty periods, assists in the development of these bolls and enables a better class of cotton to be produced in this portion of the crop.

PLATE 120.
Illustrating the use of recommended types of cultivators—in clay soil following a rain. (Young beans in foreground.)

THINNING.

Distance between Plants.

In a country where cotton-growing is comparatively new and the seasons are variable, it is difficult to arrive at the correct manner in which to thin the cotton crop. At the beginning of this recent revival of cotton-growing in this State, there were tried many methods of spacing of the plants, heights of thinning, &c. Varying results were secured, but, by a process of experimentation and elimination, the majority of the growers seem to have arrived at the conclusion that the plants should be spaced from 18 to 24 in. apart, depending on the soil and climatic conditions.

Plate 121.—A Well-cultivated Field of Young Cotton.

Many growers at first endeavoured to follow the system of leaving the plants close together, which has proved so successful in the U.S.A. cotton crops. Very poor results were obtained from such methods, both in regard to yield and the quality of the fibres produced. The explanation lies in the fact that the winter rainfall is so light that there is no possibility of having a "season in the ground" as does the American cotton-grower, who often has to delay planting preparations on account of wet soil. Usually the Queensland cotton-grower plants following the first light showers, when there is just sufficient moisture in the top soils to carry the crop to the flowering period. Unless good rains fall then a marked reduction in the yield may result and frequently the quality of the fibres will be decidedly affected. It can be seen, therefore, that the problem of the Queensland farmer is to determine methods of combating semi-droughty conditions in the early period of

the plant's development and possibly severe droughty ones in the later periods. In some seasons this may be changed to heavy rainfall conditions in the later period of the plant's development.

Experiments conducted by the Department of Agriculture and Stock in conjunction with farmer co-operators and on the State Experimental Farms indicate that a spacing of 20 in. apart on the average soils gives very good yields in properly grown fields. This may be modified according to soil conditions, as it appears that, on the less fertile soils of the hilltops and upper slopes, a spacing of 18 in. apart is suitable, while the rich alluvial loamy creek soils require the plants at least 24 in. apart. There is no fixed rule in regard to this point, and each grower has to find the proper spacing for his own particular soils. It is suggested, however, that the aim should be to ascertain the distance which will give the most insurance of obtaining a profitable crop under variable conditions, rather than to hope to get in each year the highest possible yield which the soil is capable of producing.

Height of Thinning.

The proper height at which to thin the plants is very important under Queensland conditions. A large percentage of the cotton-farmers are growing this crop in conjunction with dairying, and often with a limited amount of labour. Under such conditions only a certain amount of time is available each day for the thinning of the crop. It becomes very necessary, then, for the grower to anticipate the behaviour of the plants, in order to complete the thinning operations before any material damage has been done through overcrowding.

Experiments seem to indicate that the ideal time to thin in the average crop is when the plants are 6 to 8 in. in height. A plant thinned at this height, especially when in a good strike, is less likely to develop excessive vegetative characters after thinning, and also escapes the development of any spindly growth. The longer the thinning is delayed, the more likely is the plant to become of an elongated appearance with practically no bottom crop.

It can be seen, then, under good growing conditions, that a grower may not be able to cope with the situation if he waits until the average of the plants is 6 to 8 in. in height before commencing to thin. It is suggested that in such circumstances it is better to commence operations when the plants are from 4 to 6 in. tall, as this is the easiest height at which to thin, and this will enable the speeding-up of the work. It is advisable, however, if the operations cannot be completed before the last of the unthinned portion of the field is over 12 in. in height, that extra labour be employed.

Method of Thinning.

Thinning, or "chopping" as it is often called, is best accomplished with the use of a light garden hoe. This implement allows the chopper to make quick and careful strokes, and does not cause so much strain on the forearms as does the heavy "chipping" eye-hoe which is generally

used on the farm. Proper care should be taken to adjust the handle of the hoe to suit the user's height, reach, &c. The blade of the hoe should be set so as to give a cutting stroke rather than a flat scraping one, as the latter is more conducive to splitting the stalk and necessitating a second stroke. A set of the blade suitable to a short man may be entirely unsatisfactory to a tall man, &c., so that it can be seen that a decided increase in efficiency with the same amount of effort may be obtained if the use of the chopping hoe is carefully studied. The edge of the hoe should always be kept sharp by means of a flat file, and a few strokes at the end of the row help to keep the edge in good cutting order.

With a properly adjusted garden hoe an experienced "hand" can chop 3 acres a day on land that has been properly cultivated to destroy weed growth along the sides of the rows. Under the Queensland conditions it is believed that a man should do an acre in the usual time that a farmer who is dairying can spend in the cotton field in a day. This should be increased considerably where the full day is spent in the field, as the wider-spaced rows in the cotton fields in this State mean a considerable reduction in the row footage in an acre, to that which is used in the cotton fields in U.S.A. There $1\frac{1}{2}$ to 2 acres a day is very ordinary chopping for such conditions as exist here.

PLATE 122.
Illustrating the height of the Plants when thinned at the Callide Cotton Research Farm. These plants average about 6 inches in height.

When chopping out the cotton it is not necessary to dig deep into the ground in order to insure that the plants will not sprout again. As long as the hoe cuts below the point at which the two seed-leaves occur, there is no likelihood of any further growth. This eliminates the using of so much extra force to the stroke and also speeds up the whole operation. It also reduces the amount of loss of surface moisture which occurs where the hoe digs into the ground to such an extent as to remove all mulch between the plants.

PICKING.

In normal seasons picking usually commences during the latter part of February and continues on until the end of June, or, in the case of late-planted cotton, the end of July. In determining when to begin picking, the grower should take into consideration if the cotton is thoroughly mature, and if there are enough open bolls to allow a picker to make a satisfactory day's tally. Generally it may be taken that when there are 10 to 15 open bolls per plant these conditions exist, and picking should commence.

Given a well-grown crop of a good stand, with 10 to 15 properly open bolls per plant, an inexperienced picker should soon be able to average a daily pick of 100 lb. or more of seed cotton. In several of the districts it has been usual for the more experienced pickers to average 150 lb. and upwards, and it is anticipated that this figure will be consistently raised as the pickers become more accustomed to this operation and the growers more proficient in the production of the crop.

The Department of Agriculture lays particular stress, in the cotton-breeding operations, in endeavouring to increase the size of the boll and the suitability to rapid picking. It can be expected confidently that the rate of picking will be increased materially through the above-mentioned factors.

Methods of Picking.

The actual operation of picking is best performed by using both hands. At first this appears to be somewhat awkward, but as one becomes more experienced the increased ease of picking with both hands greatly assists in increasing the day's tally. Some pickers prefer to pick directly into a chaff-bag hung in front of them from the waist. This reduces the amount of movement necessary to get the cotton to the sack and certainly speeds up the picking. Others prefer kerosene tins, &c., especially in the taller cottons. All may suit their taste, but the point to remember is to eliminate all waste movements and thus increase the efficiency of the operations.

Care should be exercised to avoid picking leaves, trash, or diseased cotton, as these factors play an important part in determining the grade of a cotton. One frequently finds in picking a boll that part of the seed cotton sticks in the base of the open burr. It is better to leave this than go after it again. Not only is time lost in picking it out but the quality of the cotton is generally low, being of a brownish-stained tinge and often having weak and short fibres. Consequently the grade of the rest of the boll will be lowered by the inclusion of this remaining portion.

Cotton should not be picked and packed when it is wet. If showers or light rains occur the pickers may be allowed to start when the cotton is still damp, but such cotton should be spread out and thoroughly dried in the sun. Wet cotton gins badly, and is penalised by the buyers owing to the increased amount of waste.

Observations of inexperienced pickers in good crops during the past seasons have shown that the causes of their obtaining low tallies were due to the lack of observance of the abovementioned details. It is believed that, if more attention is paid to the methods of picking, the average picker will be able to increase considerably his daily tally.

FORWARDING COTTON TO THE GINNERIES.

Most of the cotton in Queensland is forwarded by rail to the ginneries, which are located at railway centres so as to serve many areas. This necessitates packing the seed cotton in suitable containers, and the ones most commonly used are wool-packs and chaff-bags. Carefully packed, from 450 to 500 lb. of well-grown seed cotton can be pressed into a wool-pack and from 70 to 80 lb. in a chaff-bag. Frequently much heavier weights are packed in each, but it would facilitate ginning if these growers would endeavour to standardise on the abovementioned amounts. Three 500-lb. wool-packs or nineteen 80-lb. chaff-bags make a nice style of bale of lint. It can be seen that, if all growers forwarded their cotton in such multiples, a much more uniform lot of bales could be ginned than where extremely varying amounts are forwarded.

In packing the containers it is desirable to include a uniform grade and staple of cotton in the one container. This assists in the grading operations, and helps to insure that the grower gets the proper price for his cotton. Uniformly packed containers also greatly assist in the ginning operations, as the packs can be more nearly matched prior to ginning, which insures a more uniform class of lint being enclosed in the one bale.

The grower should thoroughly blend the various pickers' cottons before pressing into the wool-pack, as this prevents dangers of "plates" of different grades occurring in the pack. As the prices paid for a bale of lint are based on the lowest grades contained therein, it becomes necessary to pay advances to the growers on this basis. By blending, the danger of "plates" can be obviated and a much more uniform bale delivered. Care should be taken to blend only somewhat similar grades of cotton. Where badly stained or immature cottons are produced, it is to the interest of the grower and the industry as a whole that such cottons be segregated from the higher grades of mature cotton.

Each container should be branded with the grower's initials, address, and Cotton Pool Board's registered number. This not only assists in identifying the containers as they arrive at the ginnery, but is of great help in facilitating the returning of the empty wool-packs to the proper owners. A charge of 6d. per wool-pack is deducted from the grower's initial advance to cover the cost of returning the same. Every wool-pack is subjected to sufficiently high temperatures to kill all insect life which may be in the lining; this prevents the spreading of pests such as the pink boll-worm into clean areas.

GRADING.[2]

The containers upon arrival at the ginneries are opened and sufficient cotton is examined for the grade and length of fibre or "staple" to be determined by the Government grader in charge of the operations. The cotton is then weighed by an official of the Cotton Pool Board and a representative of the Commonwealth Government and stacked in the proper place in the large seed-cotton house of the ginnery. Each grade and staple is ginned separately, and the feeder pipe to the gins is fed from the contents of three wool-packs at a time in order to secure blending. If the grower has properly blended the pack a fairly uniform grade and style of cotton is fed to the gins, but where plates of mixed grades occur in the wool-pack considerable loss of time is often encountered in endeavouring to mix the cotton at the suction spout.

Each bale of lint is sampled twice during the process of ginning in order that a representative sample may be obtained. These samples are classed by the head Government grader against standards of Queensland lint cotton which have been prepared in comparison with the World's Universal Standards for American Upland cotton. The latter standards are established each year by the United States Department of Agriculture.

The Queensland seed cotton grades are based on these standards as well, so that exceptionally uniform bales of lint as regards the grade of the cotton are the rule. As pointed out, if the growers will assist by blending the contents of each wool-pack a very high standard of uniformity of grade may be maintained.

GINNING.

The ginning of the Queensland cotton crop is performed by a commercial ginning company. This organisation, under an agreement with the State Government, undertook to erect ginneries and oil-mills sufficient to serve the industry when the present revival of the cotton-growing industry was inaugurated in 1919. Ample modern ginneries of the saw-gin type and one oil-mill have been erected. During the first season since the conclusion of the system of Government control of the industry, the Cotton Pool Board has arranged with the company to gin the entire crop.

The practice of ginning all the crop at properly located central ginneries under one authority is of the utmost importance. Such a system greatly reduces the ginning charges and materially increases the efficiency of the grading and the ginning. The experiences of all other countries where small, individual, privately owned ginneries are maintained tend to show that it is extremely difficult to maintain a high standard of ginning. Every care has been exercised during the period of Government control to develop a high standard for the finished product, and it is to be hoped that this will be maintained.

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[2] Full information relating to the grading of the Queensland cotton crop is published in "Cotton Classing," by L. L. Gudge, Head Government Grader.—Extract from the "Queensland Agricultural Journal," June 1927.

MARKETING.

The marketing of the cotton crop is controlled by the Cotton Pool Board, a body elected by the growers to handle the cotton-growing industry. This organisation came into effect upon the expiration of the period of governmental control which took place at the end of the 1925-26 season. The cotton areas are divided into electoral districts, each of which sends one representative to the Board. The Government is represented by the Director of Marketing. The Board deals with all matters pertaining to the distribution of the planting seed, the receiving, ginning, financing, and marketing of the crop. A permanent office is maintained at Whinstanes, near Brisbane.

The Board pays all expenses of the crop from the time the consignments of seed cotton are placed on rail, with the exception of the grading, which is done by the Government. Upon the grading and weighing of the cotton at the ginneries, advances on a graduated scale according to grade and staple are forwarded to the growers; these advances approximate from 60 to 75 per cent. of the estimated value of the lint cotton. Upon the completion of the sale of the entire crop all expenses are deducted, and any surplus remaining is distributed pro rata per pound of seed cotton.

This entails a considerable delay in the grower receiving the full value of his cotton, but it is believed that such a system is the most advantageous that can be used in disposing of the Queensland cotton crop. The Pool Board sells the bulk of the lint cotton direct to the mills, which not only eliminates the charges of brokers, agents, &c., to the grower but enables the mills to obtain their requirements at the minimum expense, thereby allowing better prices to be paid to the Board.

PURE SEED SUPPLY.

The control of the pure seed supply is vested in the Department of Agriculture and Stock through legislation enacted with the approval of the Cotton Pool Board which represents the cotton-growers. This legislation empowers the department to have full control over the growing, the distribution, the fumigation, and the supervision of the ginning of all cotton seed required for planting purposes, and the testing of varieties of cotton. This authority is vested in the department in order to insure the continuity of the plan of pure seed control which was instituted when the industry was under the system of the Government-guaranteed prices, in which the Government acquired all seed cotton raised in the State.

Under the plan instituted by the department, the Cotton Belt is divided into several districts. In each district a system of developing supplies of seed is in force which aims to provide sufficient seed to meet all the requirements of that area. This supply of seed is bred up by means of a system of bulk selecting large masses of plants of a single type which is thought the most suited to the district. The seed from

these is increased until sufficient to meet all the requirements. It is apparent that such a system requires a fresh supply of selected seed each season, but it is a method of preventing any marked deterioration taking place within the variety, and if properly done will enable a good class of cotton to be produced.

The system of individual progeny selections is also carried out in each district, whereby the purity of the progeny of any one plant is determined before any bulk increase of the seed is made. Under such a method a considerable length of time may be required before a pure strain of sufficient merit to warrant general distribution is obtained. It can be seen, therefore, that the bulk selection method has an important place in the seed supply system, as it provides a good commercial cotton while the plant breeder is endeavouring to develop a pure strain from a single desirable plant.

Each season certain areas in each district are designated by the departmental officers as having the best-grown cotton from which to obtain the supplies of planting seed. All seed cotton required from these areas is sent to the ginneries under proper identification marks, where it is segregated according to districts and ginned separately. The seed from this is separately treated in Simon's Heater at a temperature of 60 to 65 deg. C. for any possible pink boll-worm or other insects, and then sacked for distribution in the particular district from which it came. Germination tests are also made to ascertain if the seed is thoroughly suitable for planting purposes. The grower can see, therefore, that every effort within the present means of the department is being made to provide him with the most suitable seed of the variety of cotton thought best suited to meet his conditions.

ONE-VARIETY COTTON-GROWING.

It is believed that every effort should be made to keep Queensland on a "one-variety" basis if possible. The general trend of opinion amongst the cotton authorities of the world favours the growing of as few varieties as possible in a country and only the one variety in any particular district. The benefits obtained from such a system react not only on the grower but also on the spinner and the consumer of the manufactured article. This fact is becoming more appreciated each year, and especially in Egypt and the U.S.A. has marked progress been effected along these lines. In the State of California, U.S.A., the Association of Cotton Growers has set an excellent example for cotton-producing countries to follow. They have asked their State Legislature to pass a law making it a penal offence for anyone to grow any cotton other than the authorised variety for that district. They also have developed a system to supply pure planting seed which functions under the control of the association and the State and Federal Departments of Agriculture, so that the growers can be assured always of good seed of the best variety suited to their district being supplied to them.

A district growing only the one variety of cotton is benefited in that the purity of the planting seed can be maintained to better advantage, the problems connected with cultural practices become easier to solve, thereby increasing the general standard of production, the operations relating to picking and ginning are simplified and performed more efficiently and economically, and the average quality of the crop is more uniform and of a superior standard. These factors are all instrumental in increasing the value of the cotton crop to the grower in that the general improvement in all of the operations, due to the uniform variety, assists in reducing the cost of production, and the high quality of the lint induces buyers to pay premiums for it.

The cotton-grower can thus appreciate why the Department of Agriculture is endeavouring to breed up strains in each district which will enable all of the growers to obtain profitable returns and still keep the State on a one-variety basis. It is realised that the variety which

PLATE 123.

A "bulk selected" breeding plot of the Durango variety of Queensland Upland Cotton, grown in 1926-27 at the Callide Cotton Research Station. This plot yielded at the rate of 1,708 lb. per acre of seed cotton of a staple length of a full $1\frac{1}{8}$ inches.

is being grown at present may not be the most suitable although excellent results are being obtained from it. Breeding plots and variety tests of other varieties which may be suitable to Queensland conditions are being grown under the proper isolated conditions. It is anticipated that this very important problem will be solved when sufficient time has elapsed to enable the proper amount of data to be collected from these experiments.

THE STATE OF THE INDUSTRY.

It may be stated that the cotton-growing industry in this State is in a stage of transition between a system of assistance under governmental control and unassisted control by the growers. The system of governmental guaranteed advances during the period of 1919-26 was designed to enable the growers to learn the fundamental principles of cotton-growing. Under such an arrangement the growers were assured of such prices that they were able to experiment with the growing of the crop on all sorts of soils and at long distances from the ginneries. This enabled an excellent opinion to be formed regarding the nature of the soils and the various districts in which cotton-growing was likely to be successful.

PLATE 124.—A FIELD OF DURANGO COTTON IN THE CALLIDE VALLEY IN 1926-27.

This valley is in one of the Government Land Settlement Schemes. In 1923 this was a cattle station carrying about one beast to 10 acres of country. The photograph shows the wisdom of closer settlement. Cotton-growing has brought several thousand acres under cultivation in this and the Upper Burnett Land Schemes, and it is believed will be the means of making them into prosperous agricultural districts.

At the termination of the period of guaranteed advances, the growers requested the Commonwealth Government to grant a system of bounties on seed cotton for a term of years. It was felt that the industry had not reached a stage where it could continue without some assistance. While large numbers of the growers were producing splendid yields of cotton, the average yield per acre was still low. Many growers had developed systems of farming whereby they obtained yields of 700 lb. or better of seed cotton per acre each year. Under favourable circumstances these yields reached as much as 1,500 lb. of seed cotton of excellent quality per acre, and results as high as 2,184 lb. per acre

had been recorded. It was realised, however, that there was much to learn in the finer details of growing the crop. The Commonwealth Government, realising the importance of developing the industry, accordingly granted a bounty of 1½d. per lb. on the better grades of seed cotton, and ¾d. on the lower grades, for a period of five years, starting with the season of 1926-27.

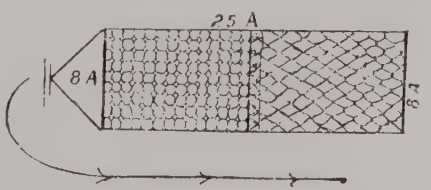
In conjunction with this bounty it was decided to develop a cotton-spinning industry in Australia. It was realised that the best markets for Australian-grown cotton would be in this country. As Australia annually imports some £15,000,000 sterling worth of cotton goods, it was believed that an industry could be developed which would eventually rank of great importance. This, then, would afford the outlet for large quantities of Australian-grown cotton. Accordingly a graduated bounty varying from ⅓d. to 1s. per lb. of yarn manufactured in this country, providing it is composed of one-half Australian-grown cotton, was granted in conjunction with the bounty on seed cotton.

The growers, have, therefore, this period of five years in which to refine their methods of growing cotton. The State Department of Agriculture is assisting in determining the proper methods by annually conducting large numbers of experiments with grower co-operators and on the Cotton Research Farm. Every effort should be made by all farmers in the cotton areas to grow as much cotton as they can properly handle. With a cotton-spinning industry practically assured in this country, an excellent future for cotton-growing awaits the farmers in those portions of this State where cotton can be grown successfully. The point to remember is that sufficient cotton should be produced to meet a considerable proportion of the spinning mills' requirements if the full value of the opportunity is to be realised.

[To be continued.]

BRUSH SLEDGE.

The accompanying illustration shows a boat or sledge for carting prunings and other rubbish to the fire heap. The description is as follows:—Take two strips of woven-wire fencing about 4 feet wide and 25 feet long. The length depends upon the size of the load to be hauled. Lay the strips side by side and fasten them securely at certain intervals to prevent the brush from slipping between. Fasten each end and the centre securely to the two-by-fours. They should be on the upper side of the wire, so that the boat will glide smoothly over the ground, and take the entire strain. Attach the swingletrees to the two-by-fours at the front end of the



boat with a heavy twisted wire or chain. The boat is then finished and ready for service. Hitch the team to the boat, and drive between the rows of trees where the brush is to be picked up. The brush is thrown on from both sides and tramped frequently. When the boat is loaded drive outside the orchard to an open space, and dump the load. This is done by making a sharp turn and driving the team back alongside the boat, thereby unloading the brush and rolling it into a bundle for burning. The boat, of course, must then be turned right side up to keep the two-by-fours off the ground.—"Australasian."

PLATE 125.—SCIENCE SERVES THE FARMER.
Display by the Division of Entomology and Vegetable Pathology at the recent Gympie Show.

AN AUTOMATIC GATE.

Travellers in horse-drawn vehicles who have ever regarded the opening and closing of gates as somewhat of a nuisance, now find when travelling alone by car that the inconvenience has increased owing to the impossibility of leading the car through the gateway as was done with the horse. Various contrivances have been adopted to obviate the necessity of alighting from a car when passing through a gateway, the most popular at present being a grid much similar to that in use at railway crossings.

The inventive genius of Mr. Jack Jones of Britannia Station in the Charters Towers District has evolved a gate that can be economically constructed, is as stock proof as any gate can be, and will open and close automatically to allow of the passage of a car or other motor-driven vehicle.

Referring to the plan, it will be observed that the weight of the car on the "run-ups" or ramps depresses them, causing the drum of the lifting gear, to the axle of which they are attached, to revolve, thereby lifting the gate to a height of 8 ft., and maintaining it at that height until the car has passed through and off the ramps on the other side.

In the original gates at "Britannia," old buggy wheels were used with sapling cross pieces to make the drum, while the other timbers necessary were cut in the bush close handy. The simplicity and efficiency of this kind of gate has impressed all who have seen it, and caused them to influence Mr. Jones to have an application made for patent rights.

In the near future, doubtless, a more or less elaborate structure will be on the market, but it is probable that those to whom such a gate makes an appeal will be able to construct gates themselves by the payment of a small royalty.—N. A. R. POLLOCK, Northern Instructor in Agriculture.

PLATE 126.—AN AUTOMATIC GATE.

PLATE 127.—MANDARINS FROM THE MORETON RED LANDS.

This remarkably fine cluster of Scarlet Mandarins, numbering 10 dozen in all, attracted much attention recently in the Roma Street Markets. For a second crop such a spray is very unusual. The quality also was good. The length of the cluster was 5 ft. It came from the orchard of Mr. James Collins, Redland Bay.

THE FARMER AND HIS MARKET.

By A. M. MICHENER, Service Department of the National Bank of Commerce, New York.*

Present hardships and discontent among farmers are not wholly the result of the war. In part they reach back to maladjustments evident before that conflict dislocated customary relationships and increased the economic strain. To a considerable extent they have their roots in a lagging adjustment of agriculture to improving technique in transportation and production. This lag was aggravated but not caused by the war. Nor is it peculiar to agriculture. Industry has been faced with similar developments; but because of inherent differences in its nature the problems of agriculture have been different and its response to conditions has been slower.

While in point of time development of transportation facilities has brought the farmer closer to his market, geographically it has carried him farther and farther from it. Even for perishables the significance of time and distance has been greatly reduced by refrigeration. These very factors which have enabled the farmer to reach more distant markets have made possible the expansion of those markets through concentration of industrial population, this in turn encouraging the use of more and more remote areas for agricultural production. The result has been to attenuate if not to destroy the farmer's contract with the consumer.

Not only was the field of competition extended by the opening up of new regions to commercial agriculture, but its force was intensified by improved technique of production, which tended to outrun increasing demand. To relieve this situation, the farmer is compelled more and more to turn his attention to distribution, seeking to cheapen the process, shorten the route, economically if not physically, and renew his contract with the consumer.

An essential step toward these ends is standardisation of products. In the common language of standardised grades is found the meeting ground with marketing agencies and consumers of which he has been deprived by geographic remoteness. Moreover, in standardised grades is found a meeting ground with other agricultural producers, affording the fundamental basis for competition. Through this medium the essential factors of a market can be brought together on a scale commensurate in extent with that of production and consumption without assembling those factors physically. The market can be brought to the farmer when he can no longer carry his produce to it.

While this step in distribution is being brought upon the farmer by the same economic forces that have induced manufacturers to establish a nationally advertised brands and trade marks and to put up package goods which are carried sealed from factory to consumer, the farmer's response has been somewhat different. In manufacturing industries these distributive devices have been made possible by concentration of management and by production in large scale units. Because of the nature of one of its raw materials, land, agriculture must remain relatively decentralised in operation.

Despite this fact there is some evidence of a tendency toward concentration of ownership and control in agriculture which may afford it a basis similar to that developed by industry. Alternative tendencies also are present, however. Many of the advantages of large scale organisation for studying the technique of production are already available to farmers through the service of Federal and State Departments of Agriculture and agricultural colleges and experiment stations. The growing use of this service by individual farmers is attested by improving methods and increasing efficiency in production. Benefits of grading and large scale marketing operations are secured in some instances by co-operative organisations among farmers. There remains for others, however, the need for control of quality and maintenance of standards such as are provided for manufacturers by large scale organisation.

A good beginning has been made in meeting this need through governmental agencies as research in production has been cared for. The position of such agencies as disinterested parties has been a great advantage in carrying forward the work and, in the case of the Federal Government, also the nation-wide scope of its activities. But a large field still awaits the initiative of the farmer in solving his problems of distribution.

The value of reliable standards for agricultural products was recognised long ago, even as it became manifest in industrial progress. But the difficulties were greater and the pressure toward it gathered less rapidly. In some agricultural lines the exigencies of the situation had brought action, either on private initiative or

*In the "Commerce Monthly" for August.

through governmental agencies, even before the outbreak of the war. In the necessities of the war and in the depression following it the need was keenly felt, and rapid progress in standardising grades has since been made both by governmental agencies and by producers' organisations.

With a background of long study of the problem, the United States Department of Agriculture was in a particularly favourable situation to take immediate steps. Uniform and recognisable standards for farm products had been part of the Department's pre-war programme to improve the position of the farmer in marketing his produce. Moreover, they were a necessary adjunct to other parts of that programme—the market news service and the establishment of accredited warehouses whose receipts, as collateral, would aid the farmer in securing better terms for credit. The Department is responsible in large measure for the wide spread of the movement toward standardised grades and for the rapid advance that has been made in recent years.

Grades Now in Use.

Standards covering at least certain characteristics are now in use, officially or tentatively, for such commodities as cotton, wool, and tobacco, for the main commercial dairy products, grain, broom corn, hay, soy beans, the principal fruits and vegetables, and the more important kinds of live stock and meats. Tentative grades have been prepared for honey, and work is progressing on standards for oil content of cotton seed.

These grades are by no means all on the same basis of authority, nor have they reached the same degree of acceptance and use. But already they have brought improvement in the ease of marketing and distribution. They are particularly serviceable in the trade, requests for them frequently originating there. Retail sales are still largely on the basis of direct and unaided inspection by the purchaser. At the other end of the line, the farmer still has in many cases rather limited direct access to Government inspection and grading. But even through indirect contact they have demonstrated in striking fashion their value to him, thus paving the way for further progress.

The official grades so far worked out do not attempt to cover all points of quality in the product dealt with, but rather to set up standards for those characteristics which may be readily determined on a commercial basis. For example, potatoes are classed in their grades according to similar varietal characteristics, size, freedom from freezing injury, soft rot, damage caused by dirt or other foreign matter, sunburn, second growth, growth cracks, hollow heart, cuts, scab, blight, dry rot, disease, insects, or mechanical or other means. To allow for slight variations a certain tolerance is permitted from these specifications.

While these grades give no assurance beyond varietal similarity as to the internal quality of the potatoes, they do give definite standards for measuring the external characteristics and condition of a shipment. The standards are readily applied and are objective, so that individual judgment and bias play a minimum part in their application. The grading of a lot is based upon sampling, and here care must be exercised to secure a representative sample. Not all commodities lend themselves to purely objective standards. Butter and cheese require the use of taste and smell; but, as far as possible, official grades are designed to eliminate the personal factor. Even descriptive terms are carefully defined.

In working out standards the usual method of procedure is for agents of the Department of Agriculture to prepare tentative grades based on the usage of the trade throughout the country. Efforts are then made through hearings and otherwise to ascertain the reaction of interested parties—producers, traders, consumers—to these grades, and finally to arrive at a system of grades that will be acceptable to all interests. Mostly they are used experimentally for a period by the Department and even in commercial transactions. When what appear to be satisfactory grades have been arrived at, they are promulgated as official United States grades, although still further amendment can be and often is made.

For some commodities official grades have been made mandatory under specified conditions, but in most cases they are permissive—that is, the service of inspection and grading is available to interested parties upon the payment of a small fee. Where States have regulatory laws, United States standards are frequently adopted as the official State grades, and are even made mandatory as far as the authority of the State extends. It was reported in the fall of 1926 that altogether thirty States had officially adopted one or more of the United States standards for fruits and vegetables.

The two important cash crops, cotton and wheat, have been provided for by special laws, which afford the legal basis for United States standards and which

make those standards mandatory under prescribed circumstances. The remaining official standards have been established under three general enabling Acts—the Warehouse Act, the Food Production Act passed during the war, and its successor in annual Appropriation Acts providing for the continuance of the inspection service begun under it.

Standards for Grain.

Following upon the establishment of cotton grades, the Grain Standards Act was passed in 1916, making the use of official standards when they had been promulgated mandatory for all transactions in interstate and foreign commerce except those by sample. Under this Act grades were established for shelled corn in 1916, for wheat in 1917, for oats in 1919, for rye in 1923, and since that time for grain sorghums, feed oats, mixed feed oats and barley. Standards for milled rice and rough rice have been recommended and are used as a basis for trading, but have not been made official and are not under Government inspection.

Wheat grades are based upon such measurable physical characteristics as test weight per bushel, moisture content, proportion of damaged kernels, foreign material other than dockage, and wheats of other classes. Grade specifications for other grains are of the same general type. Methods of making the tests are prescribed and numerous devices have been worked out to aid in their speed and reliability.

The official grain grades have gained wide acceptance and are generally used for all kinds of commercial transactions except mill buying of wheat for grinding, where characteristics other than those included in the official grades are frequently considered. Like the cotton standards, United States grades for grain, especially wheat, have received recognition abroad, and are rather generally accepted as a basis for purchasing from this country. To a greater extent than in the case of cotton grain grades are carried directly back to the farmer.

The Warehouse Act, passed in 1916, is the basis of another series of grades, which are mandatory for the purposes of the Act. Originally the provisions of the law applied only to cotton, grain, wool, and tobacco, but in 1923 it was amended to give the Secretary for Agriculture authority to place under it such other products as he might consider properly storable. Since that time a number of other products have been added to the list.

Receipts issued for goods stored in warehouses licensed under the Act are required to designate in some manner the grade of the goods and to employ for this purpose official United States grades when such have been promulgated. For commodities not already provided with official grades the Secretary is authorised to set up standards, or to designate what grades or requirements shall be followed.

Cotton and grain standards were, of course, already provided for when the Act came into force. There had long been a desire for wool standards, manifest even as early as the fall of 1914 in a request from the National Wool Growers' Association. In 1923 standards covering diameter of wool fibre were promulgated under the Act and also became effective for permissive use outside warehouse transactions. At the suggestion of manufacturers' associations, which had endorsed those standards, consultations were held with British users and in 1926 a uniform set of wool standards was agreed upon and the former United States grades were revised accordingly. Corresponding standards for wool tops were also agreed upon, uniform for the two countries, and were promulgated in 1926. Thus for wool, an important import commodity in the United States, the official grades in this country are in conformity with those in Great Britain, the chief world market.

Tobacco Grades.

Tobacco grades also have been established under the authority of the Warehouse Act. To provide for the great variation in characteristics of tobacco the American-grown leaf is divided first into six classes—flue-cured, fire-cured, air-cured, cigar filler, cigar binder, and cigar wrapper. Within these classes types are distinguished, twenty-nine in all, for twenty of which tentative grades have been prepared, representing approximately 97 per cent. of American production. These grades are based upon quality, colour, and length of leaf, with definite standards established for each.

While not yet officially promulgated for general use, these grades have been employed successfully for more than four years in the administration of the Warehouse Act, and have been used by co-operative associations as a basis for settlement with their members. They have served for the grading of more than a billion pounds of tobacco, and already they are having a marked influence upon farmers.

Grading Under Inspection Service.

The remaining grades prepared by the Department of Agriculture are permissive. Many are still tentative and a number yet in the experimental stage. Developed in connection with the inspection service, these standards find their legal basis in the annual appropriation Acts enabling the Secretary for Agriculture to "investigate and certify to shippers and other interested parties the class, quality, and/or condition of cotton, fruits, vegetables, poultry, butter, hay and other perishable farm products when offered for interstate shipment or when received at such important central markets as the secretary may designate, or at points conveniently reached therefrom."

The field of perishables is one where the services of the department have been particularly helpful, since there has been little progress in co-operative sales organisation among growers of highly perishable short-season truck crops for shipment to distant markets. Dairy products, including eggs, have been somewhat better cared for through producer activity, but even here there is a wide field of usefulness open to official grades. Among live stock producers numerous co-operative marketing agencies have been formed, but these do not appear to have made any special attempt to establish producers' grades.

Live Stock.

The live stock market is abundantly illustrative both of the problems encountered in attempting to prepare a set of grades and of the conditions it is sought to remedy. The value of the live stock depends largely upon the quality of meat. In preparing an experimental set of live stock grades, it has been necessary to arrive at some determination of external characteristics which appear to give the closest indication of the quality of the dressed meat. The basic division into classes, such as steers, heifers, lambs, and so forth, and into age and weight groups is relatively easy, and these factors are important determinants of meat quality. Beyond these divisions the grades proposed are based upon three types of characteristics—conformation, finish, and muscle quality so far as it can be determined in the live animal. Difficulties of grading are further enhanced by the fact that within the basic classes and groups grades depend upon the application of descriptive terms. Moreover, each animal must be graded individually.

Proportionate to the difficulty of grading live stock is the need of the producer for some kind of uniform market standards. Because of these very difficulties of grading, trade practices have remained in a particularly unorganised state. Live animals have always been bought on inspection at the central markets and descriptive terms are subject to variations between markets and even in the same market between different times of year or different seasons. With improving rail facilities and market reports, producers are less inclined than formerly to confine their shipments to a single market, and a basis for accurate comparison of quotations in various markets is, therefore, especially desirable. Moreover, producers of live stock, particularly cattle and lambs, are frequently long distances from their markets, making the presence at the market of a disinterested grading authority especially serviceable.

Carcass meats are somewhat easier to grade since they are practically the final product. But they, too, are gauged mainly by the application of descriptive terms, and again each carcass must be graded. Standard grades have been prepared for the principal kinds of meat, but have not yet been made official under the inspection authority except in the case of carcass beef. Substantially these same grades for all meats have been used since 1917, however, by the Department of Agriculture in its market news service, and they have been the basis of grading millions of pounds of meat purchased by Federal and State authorities. Within the last few months an experiment has been begun in stamping beef carcasses with official grade marks for identification in retail cuts, in order to test consumer demand for the assurance furnished by these standards.

Butter and Cheese.

Butter and cheese are far more easily graded than live stock. They are already in the state to be consumed, sampling is an adequate basis for grading and in addition to flavour and aroma certain measurable objective characteristics such as moisture content and physical condition are involved.

Eggs.

Tentative grades issued for eggs depend upon standards for individual egg quality, which are based on the condition of the shell, position and size of the air cell and condition of the yolk, white and germ. On this same basis, plus average

weight, buying grades have been established for easy application by the local buyers who secure eggs direct from producers. Another set of grades has been devised for use in wholesale trading, based on the number of eggs of each grade, according to the individual standards, found per case and upon a series of minimum average weights and upon varying degrees of uniformity. Still a third set of grades, on the same principle as the wholesale grades, but with subdivisions within the grades, has been provided for use in retail and jobbing channels.

While United States egg grades are still far from finding country-wide use, the buying grades are already employed in a number of localities, and wholesale standards are applied as a basis of inspection in certain markets. Use of retail grades so far is confied largely to contract purchases by Government agencies and public institutions.

Fruit and Vegetables.

Grades for these products have to do mainly with varietal uniformity and with objective characteristics and conditions, such as size, colour, firmness, freedom from blemish, decay, injury, foreign material, and so forth. The work of establishing standards in this field has been extended rapidly since 1922, when their usefulness was enhanced by a widening of the scope of Government inspection. Some of the most helpful activities and striking results have been achieved in this field.

While individually fruits and vegetables do not hold a place in the agriculture of the country at all comparable with that of such commodities as cotton, grain, live stock, and dairy products in the aggregate, they play an important part in total returns to the farmers of the country. Government grades and inspection have proved especially helpful to the farmer in handling these products because markets for them were generally more localised than for the major commodities and were frequently without much co-ordination or standardisation. Moreover, fruits and vegetables are in the main finished products when they leave the farm, passing through trade channels and into the hands of the consumer without processing of any sort. For them, therefore, standard grading is particularly effective in bringing producer and consumer into closer contact.

The Government inspection service is not only the basis for establishing standard grades for most of the commodities provided for, but it has been a very important factor in giving them utility and in popularising them. Inspection at central markets was begun by the Government as an aid to the Food Administration during the war, and was designed to cut down the waste and uncertainty prevalent in the marketing of perishables, and to reduce the economic and financial loss involved in marketing disputes. So well did it fulfil its purpose that demand for this service continued after the Food Administration closed, and after that it was provided for in the annual appropriation Acts.

Finally, in 1922, the scope of the service was broadened to include inspection at shipping points. The utility of this last step is attested by the demand for the service, a demand which the Department has so far been unable to meet fully. In 1926 a total of 165,529 cars was inspected at shipping points, one-fourth more than in the preceding year and a marked increase over the 73,000 cars inspected during the fiscal year 1923, the first year of operation. Inspections at receiving points in 1926 were only 32,531 cars, less than a single year's increase in shipping-point inspections and but a small advance over the preceding year. The whole inspection service is practically self-supporting. While an appropriation is made for it annually, fees charged to cover the cost of the service are returned to the Treasury.

Inspection at Shipping Points Emphasises Value of Grades and Standards.

The shipping-point inspection service has probably done more than any other single activity of the Department of Agriculture to bring directly home to the farmer the meaning and value of standard grades. It gives him, in the first place, an immediate measure of the value of his products. It shows him the shortcomings of his output and affords the basis of a sound programme of producing for the requirements of the market. It provides the basis for financial return in proportion to the quality of the products and their utility to the market. Value of uniformity and pack is emphasised.

By shipping-point inspection the economic waste involved in shipping ungraded and low-grade products is brought home to the farmer. When he sees his wheat relieved of carrying the freight charge on weed seeds, his marketable apples of paying the freight on culls, his good eggs of paying the freight on bad ones, the question of grading at the farm becomes of more than academic interest to him. It is estimated, for example, that over 13,890 extra freight cars were required to

haul the dockage shipped from the four spring wheat States after the 1923 crop was harvested, and more than 800,000 dollars was paid for its transportation. Farmers who cleaned their wheat at the farm gained something over 5 cents per bushel in financial return.

The value of a Government inspection certificate in protecting the farmer from claims for damage incurred in transit needs no demonstration. The still further gain of relieving purchasers all along the line from the necessity of cutting down their prices to allow for uncertain quality is not so directly evident to him, but he is likely sooner or later to profit by it.

It is through the application of official grades at the shipping point that the most striking changes in methods of distribution have been brought about. Thousands of cars of fruits and vegetables are now sold f.o.b. loading point, making it easy to direct their marketing and delivery after they are on the rails, to reduce cross-hauls and avoid central-market gluts. A tendency toward decline in relative number of consignment sales is noticeable, on the other hand.

Another interesting development is the organisation of so-called f.o.b. auction companies, which deal exclusively on the basis of Government grading at the shipping point. These companies have representatives in numerous markets and conduct simultaneous auctions over leased wires. Goods are listed and bids received entirely on the basis of Government certificates. Business can be handled very expeditiously and sales are often made while the actual produce is still hundreds of miles away. The shipment can then be directed by the shortest route to its destination without necessarily passing through a central market, yet as far as the transaction is concerned it has had the benefit of an even wider market than could be found at a single receiving point.

These developments illustrate the strides that have been made through the Government's shipping-point inspection and grading service in renewing the contact of the farmer with the market. Through this service official grades, country-wide in their applicability, are carried to the farm. Through the flexibility it allows in trading and handling it makes possible the broadening of the market to a scale that can bring to the widespread production and consumption of to-day a utility comparable with that of local markets to local constituents.

Despite the very great value to the farmer of Government inspection service and of the uniform standards established for many of his products, they have obvious and unavoidable shortcomings which leave a whole field open for the farmer's own efforts. The standards and the inspection are of necessity confined largely to external characteristics. The farther they get from such measurable bases the more difficult it is to eliminate individual judgment in their application and to maintain their uniformity. They leave practically untouched the question of inherent quality of value in use.

For inherent quality the producer alone is responsible, and he alone can maintain it, in so far as it can be maintained in the face of varying weather and other conditions. In this fact lies the basis of similarity of his marketing problems with those of industrial producers, and in this fact also his opportunity for positive, maximal standards, if they are to be established, and for aggressive merchandising. As yet the possibilities in this field have scarcely been envisaged, but more and more the vital character of the problems involved is being brought home to the producer in his struggle to maintain operations at profitable capacity.

Except where concentration of ownership has occurred, the usual resort of farmers in order to provide for merchandising on a scale commensurate with the market to be reached has been organisation for co-operative marketing. Grading of produce is a natural step in the effort of such organisations to market against competition from individuaul producers, and much has been done among their memberships to raise standards of quality. Rather than to develop their own grades, however, the tendency is for co-operative marketing associations to adopt United States standards, where such standards have been established, because of the wide recognition accorded them in the trade. This is done sometimes even when distinctive brands are also used. Not only has this practice aided the producers' associations in developing their marketing operations, but their use of the official standards has helped to widen acceptance of these standards among trade agencies.

There are, on the other hand, some outstanding instances where co-operative associations have established their own grades as well as brands, and by means of extensive advertising have secured for them recognition not only in this country but abroad. Notable among them are organisations for marketing California citrus fruits, raisins and prunes, and apples from the Pacific North west. In all these cases advertising has been carried directly to the consumer, as in the case of so many manufactured products. The citrus fruits are stamped with the brand of the

organisation, and prunes and raisins not being perishable are put up in retail packages for sale unbroken to the consumer. A similar experiment is being tried in distributing branded eggs but without the same type of advertising.

These developments are significant from the point of view of distributive technique, and they have done much to improve the quality of the products, but as yet grading even by such associations is largely on the basis of external characteristics similar to those found in Government standards. Whether greater refinements in standards of quality are possible for many farm products and can be secured by growers' organisations, and whether the market will support them if they can is still to be seen.

Even along the line of present attainments the movement toward standardising grades of agricultural products, whether issuing in governmental activity or producer control, is bound to have a great influence upon future developments in the agriculture of the country. That a more effective mechanism of distribution in line with the possibilities of modern transportation and communication will help to relieve the present difficulties of the farmer there can be little doubt.

LIVE STOCK IN QUEENSLAND.

The Registrar-General, Mr. George Porter, has kindly supplied the following statement showing the number of Live Stock in the several Pastoral Districts and in the State on the 1st January, 1927, together with similar details for last year :—

District.	Number of Horses.		Number of Cattle.		Number of Sheep.		Number of Pigs.	
	1926.	1927.	1926.	1927.	1926.	1927.	1926.	1927.
Burke ..	53,690	42,738	825,822	685,267	2,928,780	1,978,074	516	414
Burnett ..	39,283	38,185	467,036	440,562	5,263	7,487	32,933	30,808
Cook ..	49,072	44,252	527,624	520,708	270	12,580	7,673	8,323
Darling Downs	72,569	69,158	468,389	414,433	1,862,217	2,045,745	42,180	35,664
Gregory North	24,711	19,119	297,335	212,735	1,964,021	1,086,545	36	35
Gregory South	10,215	10,429	176,275	135,915	286,189	344,859	1	1
Leichhardt	48,058	40,384	761,676	568,449	979,070	840,487	1,915	1,513
Maranoa ..	29,254	28,607	273,224	235,658	2,785,128	3,366,810	1,553	1,485
Mitchell ..	41,258	33,318	196,115	114,015	6,696,458	4,135,681	498	460
Moreton ..	65,461	62,730	502,658	476,828	25,257	22,022	75,731	69,895
North Kennedy	70,456	62,899	503,296	454,412	4,528	22,214	5,673	5,160
Port Curtis	39,093	33,486	449,203	383,711	27,462	28,040	8,523	7,877
South Kennedy	37,985	33,879	432,297	328,545	154,642	165,182	1,281	1,709
Warrego ..	24,255	21,684	236,587	191,168	2,938,281	2,799,535	600	510
Wide Bay..	33,012	30,754	319,108	302,439	5,757	5,511	20,485	19,808

	Horses.	Cattle.	Sheep.	Pigs.
Total for year 1926 ..	571,622	5,464,845	16,860,772	183,662
Total for year 1925 ..	638,372	6,436,645	20,663,323	199,598
Decrease	66,750	971,800	3,802,551	15,936

FARM TRACTORS AND THEIR MANAGEMENT.

By E. T. BROWN.*

Recently I was an interested listener to a discussion between two farmers. One was running his farm as a motorised farm and the other relied upon horses for his power. I am not going to recount the discussion in full, but a summary of the statements of both parties may prove instructive. Let the last-mentioned farmer speak first. He claimed that horses were preferable for the following reasons:—When horses are employed less artificial manure has to be purchased and these manures are expensive; a tractor depreciates in value from the time it is bought, but a horse grows into money; ploughing by tractor cannot be done more cheaply than by horse power; more labour may be required for horse work, but skilled labour—at a high price—must be used for tractor work; horses work practically every day of the year, but tractors do not; if a horse falls sick it can be replaced, but if a tractor goes wrong the whole work of the farm is delayed; the work of looking after a tractor is greater than the daily attention needed by horses; for light work or ploughing on hilly land horses give better results; and, lastly, it is bad policy for a farmer to sink too much money in machinery.

The Tractor Owner Speaks.

The owner of the motorised farm was most emphatic, and he stated that his arguments were unanswerable. They were as follows:—The tractor saves the farmer time, worry, and money—Time, since the tractor accomplishes the work more expeditiously; it saves him worry, since his work is not controlled to the same extent by the weather; it saves him money in all directions. The tractor allows a farmer to overtake an excess of work at the rush season of the year when it is extremely difficult to obtain additional labour; the quality of the work done is better, especially as regards ploughing; less man power is required on the motorised farm, since one man with a tractor can raise three or four times as much in the way of crops as a man with a team; a tractor releases a large amount of food that can then be used for feeding to stock with a view to meat production. It releases about five acres of cultivated land for every horse that it replaces.

The Non-Tirable Tractor.

A tractor will work for very long hours so long as it is supplied with the necessary fuel, oil, and water. It does not grow tired, and, moreover, there is no need to rest it during the day; it can be employed most efficiently for all kinds of belt work, whether the stationary machines to be driven are large or small; road haulage can be performed more quickly and much more cheaply with a tractor than with horses, since the power of a tractor is sufficient to haul a heavy load at a decent speed over average roads; a tractor costs nothing for upkeep when it is not being used, whereas horses have to be fed whether they are working or not; a tractor does not require feeding, grooming, nor does the stable have to be cleaned out daily; and, lastly, the cost of working a tractor is less than when horses are employed.

Wagon Hitches.

Ordinary farm wagons can be employed as trailers for the tractor to draw, but it is essential that the hitches used should be suitable for the purpose. A considerable portion of the power generated by the engine can be wasted if the hitch be improperly set. As a general rule, it is found that the ordinary farm wagon is too high, when the shafts have been removed, to hitch directly on to the draw-bar of the tractor. If the connection be made direct, when this difference in height exists, two results follow: The front of the wagon is pulled downwards—the wagon is always higher than the tractor—and the rear of the tractor may be eased off the ground. This will add very considerably to the weight of the trailer and its load, and it will reduce the adhesion of the rear wheels of the tractor, thus causing great loss of power. The solution of the difficulty is, of course, to bring the level of the two draw bars equal. Place the connection on the wagon as low as possible, and by means of a suitably made and designed bracket, supported by stays, attached to the draw bar of the tractor, the two can be brought into line. The bracket must be made specially for the individual tractor, since there is no universal design which will answer in all cases. When running on the road never exceed four to five miles an hour, and do not forget that the outfit must be licensed and an annual tax paid.

* In the "Farmer and Settler."

THE LATE JAMES A. ROBERTSON.

AN APPRECIATION.

The cattle and pig breeding industries of Australia, and especially of New South Wales, have suffered a severe loss by the death of Mr. James A. Robertson, M.R.C.V.S., Herd Master to the Department of Agriculture, New South Wales, which occurred suddenly at his home at Lindfield on the North Shore line, Sydney, on Monday, 26th September.

Mr. Robertson attended the Melbourne Show on departmental and Herd-book business, spending an exceptionally busy week, returning to Sydney apparently in normal health on the Friday before his death. On Sunday he had a seizure, from which he never rallied.

As a cattle breeder Mr. Robertson had attained a foremost position in Australia. He had a sound and deep knowledge of the various breeds and of the principles of breeding, and this he applied with the intuition of the master breeder. When he entered the service of the New South Wales Department of Agriculture, thirteen years ago, the State dairy herds were at a low ebb, but by careful selection and judicious but not lavish introduction of new blood they have been developed to a high plane on both standard and production lines.

Mr. Robertson paid a great deal of attention also to the pig studs at the several Government institutions, and his influence for good in suggesting and carrying through improvements in these studs resulted in a very considerable improvement in type and quality of the animals bred and exhibited.

Mr. Robertson was born in 1884, and his early training was acquired on the Coolangatta Estate, on the far-famed South Coast of New South Wales. At the age of twelve years he was conducting milk and cream tests for the Jersey Milk Condensory on the estate. He spent some time also at Logan's Aston Estate, in the Bombala-Delegate districts of New South Wales, and later started out on his own in the dairying business. He went to Edinburgh in 1905, and four years later graduated with honours as a veterinary surgeon at the Royal Veterinary College, and was offered a post on the college staff. This, however, he did not accept, but returned to Australia and began practice as a veterinary surgeon at Lismore, New South Wales, and four years later entered upon the official position as herd master, which he has since occupied. Also for twelve years he held the position of Examiner in Animal Husbandry and Meat Inspection at the Technical College, Sydney, and in dairy farming and live stock at the Hawkesbury Agricultural College, Richmond.

Part of Mr. Robertson's early apprenticeship was served under Messrs. John Pottie and Sons, well-known veterinary surgeons of Sydney.

His place will be a difficult one to fill both in departmental and private life. He had a large circle of friends, all of whom will join in extending sincere sympathy to his bereaved widow and family.

WHEAT CROP PROSPECTS.

On his return from a recent tour of duty the Director of Agriculture, Mr. H. C. Quodling, informed the Press that, owing to the extent of country embraced in the competition, it will entail a good deal of travelling before it is finalised; since leaving Brisbane during the first week of this month over 1,000 miles have been traversed, and this has permitted of a useful survey of much of this year's wheat crop. Leaving the Maranoa district out of the question, where, unfortunately, an aggregate of only a few thousand bags will be harvested this year; also the Inglewood district, in which late-maturing crops will be the only ones to show any pronounced response to the recent rains, as the earlier-sown fields made an attenuated growth, one cannot be otherwise than impressed with the extraordinary improvement wrought by the October rains, and manifest in the wheatfields over practically the whole Darling Downs. If nothing untoward happens (and wheat is never safe until it is sound and dry in the bag) this year's yield should reach the three million-bushel mark. In some districts it is doubtful whether more promising crops have even been grown, and this applies more particularly to those on the deep, rich black and brown soils common to the Downs. The better-grown and heavier-yielding crops are invariably to be found where a system of summer fallowing has been observed. In January, the rainfall on the Darling Downs ranged generally from 8 to 11 inches, and in the first four months of the year the aggregate fall varied between 15 and 21 inches. Where the surface of the soil had been cultivated immediately after last year's harvest and brought into a fit condition to absorb moisture, and the surface subsequently kept in a state of cultivation, reserve supplies of moisture were in this way retained in the subsoil. Luckily, good rains fell in June—about three inches—

and, although July, August, and September were dry enough to cause much anxiety to growers, the October rains saved the situation, and a bountiful harvest is in prospect. "The wheatgrower has certainly had his share of disappointment," said Mr. Quodling, "but there's no question to my mind of his succeeding where early and systematic cultivation is practised. The deep soils of the Downs, particularly on the plains, do not require deep cultivation; as a matter of fact, for wheat, 3 to 4 inches are all-sufficient; but for success, the principles underlying cultivation require to be carefully observed. Better and more suitable varieties are now available to growers, and officers in the Agricultural Branch of the Department of Agriculture and Stock have accomplished very much in this direction."

"Those who are in a position to rapidly cultivate extensive areas of land by means of tractors and large horse teams, and so save the moisture before it is disseminated, will undoubtedly do much towards the improvement of Queensland as a wheat-growing State; which, in addition to sheep-raising in the agricultural districts, is also suitable for a number of other forms of primary production not generally open to settlers in other States."

Progress of Wheatgrowing.

When asked for an opinion whether wheatgrowing was showing material progress in any locality, Mr. Quodling stated that in a number of localities a distinct advance was to be observed in the area being cropped with wheat; possibly the more pronounced improvement was to be seen on the black soil plain country south-west from Evanslea, on the Cecil Plains line. There are a number of large wheatgrowers in the district, many of whom are successfully combining wheat and sheep. Their crops this year are extraordinarily promising, and yields of from 8 to 10 bags per acre will prevail. The largest individual area cropped in this locality is 2,000 acres by Messrs. Zeisemer Bros., who have very fine crops, included in which is a 640-acre paddock of Gluyas wheat, also extensive areas of other varieties. The land cropped is a fair sample of several hundred thousand acres of similar land, much of which could, and will, no doubt, be turned to similar account in the future.

WHEAT CROP COMPETITION.

SEASONAL PROSPECTS.

Wet weather interfered with the work of judging crops entered in the wheat crop competition promoted by the combined Agricultural Societies of Queensland.

The controlling Divisional Societies originally comprised the Eastern Downs H. and A. Association, Warwick; the Royal Agricultural Society of Queensland, at Toowoomba; and the Roma and Wallumbilla Agricultural Societies, certain boundaries being fixed for the purpose of the competition, for three districts known as:—

(1) Southern and East Central;
(2) North Central;
(3) Western.

No. 1 embraces the railway system of Wallangarra, Killarney, Maryvale, Goomburra, King's Creek, and Dirranbandi;

No. 2, King's Creek, Milmerran, Cecil Plains, Tara, Chinchilla, Jandowae, Bell, Cooyar, Haden, Crow's Nest, and Toowoomba; and

No. 3, Chinchilla, Cunnamulla, Injune, Juandah.

Owing to the severity of the season in the Maranoa and contiguous districts, no entries were received from growers in those areas which came under the purview of the Roma and Wallumbilla Societies; however, the other two Agricultural Societies at Toowoomba and Warwick have taken an active part in promoting the competition. Substantial prizes are being offered, and the Royal National Association of Brisbane has supplemented these by a Grand Championship Cup and other trophies.

Ten of the twenty odd crops entered through the Royal Agricultural Society of Toowoomba have already been judged.

The judging is carried out under a fixed scale of points—

(1) Apparent yield	1 point for every bushel
(2) Trueness to type and purity	20 points.
(3) Freedom from disease	30 points.
(4) Evenness of crop	10 points.
(5) Cleanliness	20 points.

The date for the receipt of entries was extended by the Eastern Downs H. and A. Association, to 29th October.

SELF-FEEDERS FOR PIGS.

ONE AND TWO WAY SELF-FEEDERS.

F. BOSTOCK, Assistant Instructor in Pig Raising.

A "self-feeder" is simply a device by means of which a supply of grain or other feeds may be kept constantly available to the pigs, in order that they may satisfy the cravings of their appetites.

Pigs in the wild state were naturally self-fed animals, living upon such foods as would satisfy their appetites. The marked success of the self-feeding system of pig raising in America is largely due to the fact that the pigs may eat an abundance of such feeds as will nourish them to the best advantage.

Pig raising as an industry is generally regarded as a profitable one, particularly when it is carried on in conjunction with some other branch of agriculture, such as dairying and mixed farming.

It is intended, in this article, to indicate how, by the introduction of the self-feeder as a labour-saving appliance, the actual amount of labour necessary for carrying on the business might be reduced.

Self-feeders, as illustrated in Figs. 1 and 2, are practicable when grain is being fed, and for this purpose are intended for use more especially during the growing and fattening stages in the life of the bacon pigs, and are not specially recommended for use in feeding breeding sows, though even for this purpose the self-feeder may be used, but if so used the mixture of foods should be more nitrogenous (flesh forming) than is usually given to baconers. This is because breeding sows in general only require a limited allowance of grain.

The two types of self-feeders as shown in the plans (Figs. 1 and 2) should be built on skids or runners to prevent pigs rooting at the floors and to facilitate moving. If strongly constructed this method of transport will be found to be much easier and quicker than loading the feeder into a wagon or on to a sledge.

Self-feeders should be designed primarily to keep an available supply of grain constantly before the pigs, and at the same time protect its contents against waste, due to wind and rain.

It consists of a hopper to hold the food and a trough below into which the grain is allowed to flow, the sliding and hinged flaps regulate the amount of grain permitted to flow into the trough as the pigs eat it.

The hopper is made sufficiently large to hold several days' supply of feed, and the inside walls should be as smooth as possible in order not to prevent the flow of grain into the trough.

When it is desired to feed two or more foods separately in the same self-feeder, a partition may easily be placed in the hopper at any distance from either end.

The self-feeder should be placed on a wooden or concrete platform if possible (Fig. 3), and if well constructed with first-grade timber, and given a coat of paint about once every twelve months, should give service for quite a number of years.

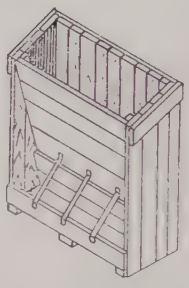
By means of the self-feeder the average farmer should obtain as good results as the hand-feeder with much saving of time and labour.

According to American experiments, there is very little doubt which method is the more economical, and as shown by the results of a number of experiments the self-feeder system is advantageous in every respect. Its use results in larger daily gains in live weight, bringing the pigs to marketable weights at an earlier date, and although the feed is consumed more rapidly there is an actual saving in the amount of feed required to produce the 100 lb. of gain. This is a fact of extreme importance and is well worth consideration.

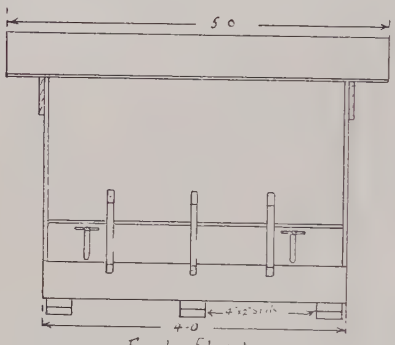
Last, but not least, one of the advantages to be gained is the saving of time and labour. At the same time, the farmer must not neglect the self-feeder; because he has filled the hopper with grain he cannot afford to forget about it. The old adage, "The eye of the master fattens his cattle," holds good when applied to the self-feeding of pigs. There are a number of things which may happen to the self-feeder if left without attention. For instance, the feed may block in the hopper, thus leaving the pigs with a dead self-feeder, or the feed may become soiled in the trough, making it unpalatable to the pigs.

In cases where a mixture of feeds is being used the farmer should furnish the proper proportions of the different feed constituents. He should feed a larger percentage of protein (flesh-forming) to the young pigs which are growing than to the older ones. Just because pigs are self-fed a mixture of feeds does not mean that they are receiving a balanced ration.

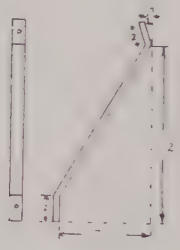
ONE WAY SELF FEEDER FOR PIGS



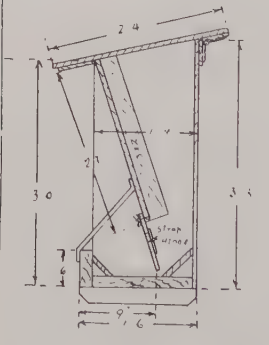
Perspective with Roof Removed



Front Elevation



Detail of Iron Strap



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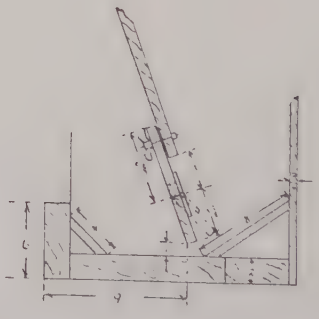
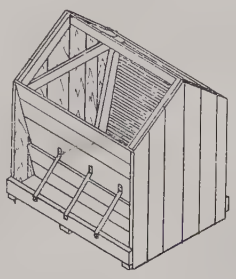


Detail of Slide and Hinged Flap

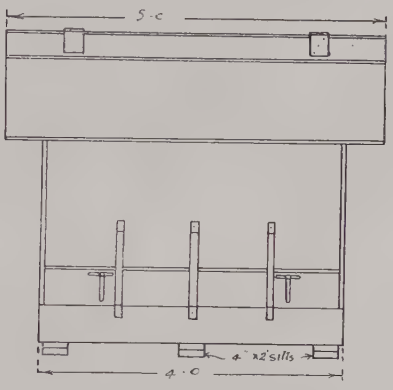
Drawn by F.G.

PLATE 128 (Fig. 1).

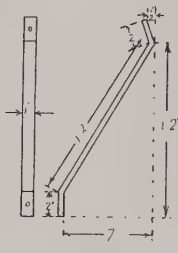
TWO-WAY SELF FEEDER FOR PIGS



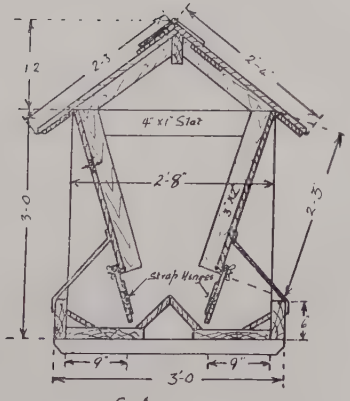
Perspective with Roof Removed



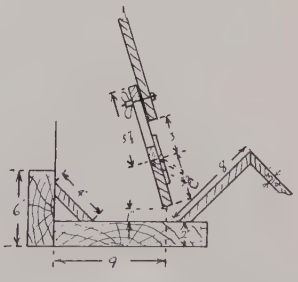
Front Elevation



Detail of Iron Strap



Section



Detail of Slide and Hinged Flap

Drawn by F.B. 31.8.26

PLATE 129 (Fig. 2).

PLATE 130 (Fig. 3).—SELF-FEEDERS IN USE ON AN AMERICAN FARM.
Note the Wooden Platform on which the Feeders are placed.

PLATE 131 (Fig. 4).—SELF-FEEDING SYSTEM IN OPERATION ON A LARGE AMERICAN PIG FARM.

A self-feeder is by no means a substitute for a knowledge of feeding. The self-feeder may be adapted to the feeding of any kind of grain, although shelled grain and ground foods are most commonly used. It may be used to feed maize on the cob, but in this case the feeder would be required to be of a larger size than shown in Figs 1 and 2 in order to hold sufficient grain to feed a number of pigs for several days without refilling.

Maizemeal or barley would require a smaller opening to prevent too rapid a flow of grain than would, say, whole maize. It will be noted in the plans that the sliding and hinged flaps have been fitted with thumb screws so as it may be adjusted to suit the type of grain being fed.

Farmers feeding with dairy by-products will have no need to feed concentrates such as protein meal or meat meal, for skim milk is very suitable to balance such grains as maize or barley. Of course, the dairy by-products should not be self-fed, for they would soon spoil if more feed is fed than the pigs will clean up at one feeding. Self-feed the grain and hand feed twice daily enough of the skim milk to balance the ration.

PLATE 132 (Fig. 5).—SHOWING METHOD OF TRANSPORTATION.

According to results of American experiments when feeding pigs without pasture, the following was found to be the average proportions in which to feed milk and grain, and should serve as a guide:—

For pigs just after weaning 4 lb. to 6 lb. of skim milk to each 1 lb. of maize will be found to be sufficient to make the maximum gains. As the pigs grow older the proportion of skim milk may be decreased. Pigs weighing 50 lb. to 100 lb., 3 lb. of skim milk to every 1 lb. of maize, and pigs at 100 lb. to 150 lb. would require from 2 lb. to 2½ lb. of skim milk to every 1 lb. of maize consumed. Pigs on pasture such as lucerne, rape, barley, &c., would need only about half as much skim milk as indicated above. Considerably more milk than previously stated may be fed with good results when a surplus is on hand. Pigs cannot be expected to do much grazing on a crop that is any distance away from the self-feeders. It is in such cases where grazing is intended to form part of the ration that the skids or runners will be found to be an advantage in taking the self-feeder to the crop it is proposed to graze off.

Copies of the plans illustrated in this article may be obtained on application to the Under Secretary, Department of Agriculture and Stock, Brisbane, Queensland.

ONE-WAY SELF-FEEDER FOR PIGS.—MATERIAL REQUIRED.

Members.	Number.	Length.	Size.	Material.
Skids	Three	1 ft. 6 in.	4 in. x 2 in.	Hardwood
Trough	One	4 ft.	6 in. x 2 in.	Pine
Trough	One	3 ft. 10½ in.	12 in. x 2 in.	Pine
Trough	One	3 ft. 10½ in.	4 in x 2 in.	Pine
Trough	One	3 ft. 10½ in.	8 in. x ¾ in.	Pine
Trough	One	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Front Panels	Five	3 ft. 10½ in.	6 in. x ¾ in., T. & G.	Pine
Front Panels	Two	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flaps	Two	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Ends and Back	Twenty-four	3 ft. 3 in.	6 in. x ¾ in., T. & G.	Pine
Ends and Back	One	7 ft.	6 in. x ¾ in.	Pine
Top	Ten	2 ft. 4 in.	6 in. x ¾ in., T. & G.	Pine
Top	Two	5 ft.	6 in. x ¾ in.	Pine

Hardware.

Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

TWO-WAY SELF-FEEDER FOR PIGS.—MATERIAL REQUIRED.

Members.	Number.	Length.	Size.	Material.
Skids	Three	3 ft.	4 in. x 2 in.	Hardwood
Trough	Two	4 ft.	6 in. x 2 in.	Pine
Trough	Two	3 ft. 10½ in.	12 in x 2 in.	Pine
Trough	Two	3 ft. 10½ in.	8 in. x ¾ in.	Pine
Trough	Two	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Panels	Ten	3 ft. 10½ in.	6 in. x ¾ in., T. & G.	Pine
Panels	Four	2 ft. 3 in.	3 in. x 2 in.	Pine
Sliding and Hinged Flap	Four	3 ft. 10½ in.	4 in. x ¾ in.	Pine
Ends	Twelve	4 ft. 2 in.	6 in. x ¾ in., T. & G.	Pine
Frame of Roof	One	4 ft.	6 in. x 2 in.	Pine
Frame of Roof	Four	1 ft 9 in.	3 in. x 2 in.	Pine
Frame of Roof	Two	2 ft.	4 in. x 1 in.	Pine
Roof	Twenty	2 ft. 4 in.	6 in. x ¾ in., T. & G.	Pine
Roof	Four	5 ft.	6 in. x ¾ in.	Pine

Hardware.

Six 1-inch by ¼-inch iron straps.
Eight 3-inch strap hinges.
Two 5-inch strap hinges.
Four 3-inch by ½-inch bolts with thumb nuts.
Nails, &c.

THE JOURNAL IN HOLLAND.

Thus the Director of the Ver Bureau Voor Handelsinlichtingen (Foreign Relations Office), Amsterdam: "... In view of the many inquiries which reach us for information about Australia .... we shall appreciate having your monthly (the 'Queensland Agricultural Journal') in our library. ...."

PARALYSIS OF THE HINDQUARTERS IN PIGS.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

In the course of recent tours both in the Northern and Central Divisions as well as in Southern Queensland, and also during a lengthy experience in New South Wales, Mr. Shelton has noticed a number of pigs suffering from the trouble most frequently spoken of as Paralysis of the Hindquarters. This disease is also, on occasion, erroneously referred to as Staggers and Rickets, while other terms used to indicate a similar condition are Down in the Back, Kidney Worms, or Paralysis.

As it is evident from a perusal of the many references to the actual cause of this somewhat unfortunate occurrence in pigs that it is largely a "deficiency" disease, one almost entirely due to an insufficient supply of mineral matters (bone-forming materials) in the food and to lack of green food, &c., it is obviously a subject that must be handled more along the lines of prevention than actual treatment; one coming within the ambit of the "instructor" more than the "inspector," and one that must be remedied more by an all-round improvement in the system of breeding, feeding, and handling than by the administration of medicine. Mr. Shelton's notes on the subject are therefore of unusual interest.—Ed.

Numerous inquiries reach the Department annually as to the cause and treatment of this all too common and very peculiar disease, if such it might be called. The subject has been dealt with previously in this Journal as well as in pamphlet form, but as both leaflet and pamphlet are now out of print, and as the trouble is of such an important nature, it warrants revision and repetition—this especially as further evidence of a very helpful nature has lately been received through official channels and from correspondents overseas.

A great deal has been written regarding "Paralysis of the Hindquarters in Pigs" and much research work has been carried out, principally with a view to ascertaining the exact nature of the conditions under which the disease occurs, and in studying the subject it is of interest to know just what other authorities are doing, and to determine whether or not their findings are applicable to our conditions in Queensland.

The disease is very largely one due to a deficiency of mineral matters in the food and to malnutrition, hence the writer's objective is to suggest how by improved methods of feeding and caring for pigs these abnormal conditions can be overcome. The Veterinary Officers of this Department should be consulted on all matters relating to medicinal treatment; their advice is also always available in case of any outbreak of disease no matter whether it be of a minor or of a more serious nature.

Paralysis of the hindquarters in pigs is, unfortunately, a trouble not confined to young pigs only, nor is it localised in Queensland. It appears to be a source of considerable trouble wherever pigs are kept the world over, though where the conditions under which pigs are kept are favourable to early maturity and to the healthy and rapid growth of all breeding stock, the disease has been kept in check and has caused but little trouble.

In referring to the occurrence of paralysis in pigs in this State and elsewhere, the Chief Inspector of Stock, Major A. H. Cory, M.R.C.V.S., states that—

"The subject of paralysis in pigs has been given considerable attention for many years past.

"A small leaflet was issued some years ago to farmers dealing with what was then considered three principal causes of the complaint, but in recent years it has been ascertained that the paralysis, in many cases, is due to the lack of a vitamine known as Fat Soluble A, which is essential to the growth of animals, a deficiency leading to rickets.

"This vitamine is found in certain herbage, milk, cream, butter, eggs (yolk), beef fat, and cod liver oil. Latterly cod liver oil has been recommended to make up for the vitamine referred to, with, as far as can be ascertained, marked benefit.

"There is little to report regarding the incidence of the disease, as it occurs in any part of Queensland where pigs are improperly fed and not given the necessary attention. The same conditions exist all over the civilised world. It is mostly young growing pigs which are affected, and generally those in good condition.

"Apart from the paralysis, the pigs usually feed well and appear normal, the pathological changes taking place being apparently microscopical."

Professor L. A. Maynard, of the New York State College of Agriculture, Department of Animal Husbandry, has written on the following lines as a result of his experience:—

"This problem has been under investigation here for several years. On the basis of our studies, we believe the trouble is the result of improper mineral nutrition which prohibits a normal development of bone. This is due to a lack of calcium in most of our rations. We have shown that where paralysis occurs, the long bones are very deficient in calcium and phosphorus, and marked histological changes have occurred. These changes have been observed on a diet low in calcium. However, a lack of calcium is not the only factor involved, because the question of assimilation also comes in.

"Certain feeds are rich in the factor aiding mineral assimilation, and certain others are not. A ration which contains a certain amount of chopped alfalfa (green lucerne or lucerne chaff) is very useful for preventing paralysis, because it supplies the needed calcium and phosphorous and the factor aiding assimilation as well. We have shown, however, that there is a very beneficial effect from the adding of ground limestone and bone meal to rations which are now causing the trouble."

In a communication from Professor R. Adams-Dutcher, Head of the Department of Chemical Agriculture at the State College and Experiment Station, Pennslyvania, U.S.A., the following remarks appear:—

"I have the feeling from the knowledge that I have been able to obtain by reading, and in experimenting, that the diet is a very important factor in preventing paralysis in pigs, and probably calcium and phosphorus accompanied by proper vitamine-carrying foods are the most important dietary factors. Any number of animals have been relieved of the paralytic symptoms by feeding bone meals or other mineral mixtures carrying calcium and phosphorous; mixtures which carry calcium carbonate have also been effective. Veterinarians in New York have had fairly good success with wood ashes, but it is my recommendation that lime or bone meal be made available in those districts where hog paralysis is causing trouble. If lucerne or some other leafy green stuff or hay is available, this would also improve the situation, helping the animals to utilise this mineral matter to the best degree of efficiency."

The following extracts have been taken at random from mimeographs supplied by Professor John M. Evvard, as a result of extensive experiment along the lines of feeding mineral mixtures, both simple and complex, to pigs not only with the idea of preventing paralysis, but of stimulating growth and enhancing the returns.

Comment.

(1) The feeding of minerals in whatever form allowed was quite advantageous in that the average daily gains were substantially increased, the length of the feeding period economically shortened, the feed required per 100 lb. gain considerably reduced, and the profits per pig enhanced.

(2) In feeding experiments the appetites of pigs for minerals is shown to be of considerable reliability, inasmuch as they clearly excelled check groups receiving no minerals.

(3) Although there appears to be some advantage gained from the feeding of a mineral mixture carrying more than the single emphasised ingredients, such as common salt, calcium carbonate, bone ingredients, and potassium iodide, yet just how far one can afford to go in the adding of other ingredients in practice is a matter for individual estimation and determination. Our experience has certainly indicated that some of the main ingredients necessary in the mineral mixtures are those that carry sodium and chlorine (common salt), calcium (lime, limestone, and bone materials), phosphorous (bone materials, rock, and other phosphates), and iodine (potassium or sodium iodide). The further addition of suitable combinations of such ingredients as common sulphur, a little charcoal, some Glauber's salts, as well as some other ingredients in small percentages or quantities has, on the whole, shown some benefits in our experimental work.

(4) It appears as if the farmer in his feeding of sulphur, charcoal, and other often-questioned materials has not gone entirely wrong, and like his well-founded belief in yellow corn (as against white corn), we should be sure of our grounds before declaring them or any of them non-beneficial.

(5) Our other work with minerals has shown the dollar and cents practicability of adding a good mixture of mineral ingredients to many ordinary pig rations.

(6) Our general recommendation is to provide a suitable mineral mixture for all classes and grades of pigs—the growing pigs, the breeding sow, the suckling pigs, the boars and all—and it is our suggestion that the mineral mixture be self-fed in an easily accessible place, well protected, and under shelter if possible.

(7) A good mineral mixture may be made up for practical everyday feeding as follows:—

Common salt, 20 per cent.; finely ground raw bone meal, or steamed bone meal, or spent bone black, or rock phosphate, or acid phosphate, 40 per cent.; finely ground high calcium limestone, or wood ashes, or finely ground oyster shell, or lime thoroughly air slacked, 40 per cent. Total, 100 per cent.

If sulphur is desired, add approximately 10 lb. to the 100 lb. To every 100 lb. of the above minerals, add from ½ to 1 oz. of potassium iodide, mixing all ingredients thoroughly.

The following remarks upon this disease form the conclusions arrived at by Dr. J. W. Connaway, a prominent American Veterinarian, who has been associated with many of the experiments relating to this particular trouble:—

Paralysis of the hindquarters in pigs may result from one of several causes, and the treatment will vary to some extent, according to the cause of the paralysis. The causes are—(1) Injuries; (2) impaction of the lower bowels; (3) kidney worms; (4) heavy suckling; and (5) lumbago or rheumatism. Each of these causes and the preventive and curative measures are discussed in order as follows:—

Paralysis from Injuries.

If the pig has been running in the same yard with horses, mules, or cattle, it may have been kicked, pawed, horned, or trodden upon, and sustained an injury to the spine, legs, or muscles of the back or hips.

Treatment.—Make a thorough examination of these parts. Sometimes an injury is deep-steated and can be detected only by firm pressure and other manipulations of the paralysed parts which produce evidence of pain, fractures of bones, or rupture of tendons and muscular tissues; or the pressure of deep-seated abscesses. If the paralysis is due to an injury, the best treatment is absolute rest. Put the patient under shelter in a comfortable pen, where it can be bedded and kept quiet. Feed a light laxative diet and keep the pen and bedding clean. After a time, a stimulating liniment rubbed over the injured parts may hasten recovery. A mixture of equal parts of turpentine, ammonia, and cotton-seed oil makes a very good liniment. An abscess should be opened and be given proper antiseptic treatment.

Paralysis from Impaction of the Bowels.

Paralysis of the hindquarters may result from an impaction of the lower bowels with hard masses of dung, causing excessive pressure upon the nerves and blood vessels in the pelvis or hip region. If the paralysed pig seems to be badly constipated, use rectal injections of warm water to soften and remove the hard lumps of dung. Add a couple of tablespoonsful of Glauber's salts to slops (food) and fed twice daily until the bowels are loose. Impaction is most frequently due to improper feeding, and to lack of tone of the bowels. A properly balanced ration with an adequate supply of water will prevent impaction of the bowels. In cold weather, pigs frequently do not have a proper supply of water. If the water is icy cold, pigs do not drink a sufficient quantity and are liable to become constipated. Some provision should be made for warming the water to take off the chill. A warm slop once a day will be helpful in keeping the bowels of the brood sow in good condition.

The following tonic will also be found useful:—Equal parts of pulverised copperas, Glauber's salts, Sal. soda, common salt, and a double portion of powdered charcoal, which should be thoroughly mixed and put in a covered trough (self-feeder), where all the pigs can have free access to it.

Paralysis from Kidney Worms.

The so-called kidney (or lard) worms "Stephanurus dentatus" (also called "Sclerostoma pinguicola") may cause paralysis of the hindquarters if these worms are present in large numbers in the sublumbar or loin region. These worms, in

the embryo stage, migrate into the fatty tissues around the kidneys, and sometimes into the kidneys and other organs, as the liver and pancreas. They produce inflammation, and at times abscesses, in the tissues where they lodge. As they are found in largest numbers in the kidney fat and loin region where the nerves are given off from the spinal cord to the hindquarters, the functions of the nerves of this region are more likely to be affected by these parasites and their toxic products.

Treatment.—A brisk rubbing or massage of the loin muscles, with an application of the liniment already mentioned to stimulate the nerves and increase the blood circulation of the affected region will be helpful. Turpentine should also be given internally; this will destroy many embryo worms in the intestines. As turpentine is very diffusible, it is believed to be useful in destroying these parasites in the tissues around the kidneys. To a 200-lb. pig give a tablespoonful of turpentine in half a pint of oil (cotton-seed or raw linseed); or warm milk may be substituted for oil. Shake well before using. Use a small-necked bottle, drenching horn, drenching bit, or old leather shoe with a small hole cut out in the point, and give the drench slowly, or smaller doses may be added to the slop (food). The following worm remedy is also useful:—Santonin 6 grains, calomel 4 grains; this quantity to a bacon pig 100 lb. live weight or twice the amount to a pig weighing 200 lb. or more live weight.

In every case, the bowels should be completely emptied before the medicine is given. The Santonin (or Areca Nut may be used in similar quantities) and calomel should be mixed thoroughly with a small quantity of dry meal or shorts (pollard), which may then be moistened and fed alone, or the meal and medicine may be stirred into the feed or slop. Repeat the treatment in a few days.

As a preventive, use freshly slacked lime liberally over the pig yards to destroy worm embryos on the ground over which the pigs feed. Give the pig yards a thorough liming and clean up several times in the year.

Paralysis from Heavy Suckling.

Brood sows that do not have a proper ration, or that are not able to utilise it effectively, sometimes go down in the hindquarters from suckling a big litter of rapidly-growing pigs. The rapid growth of the pigs require considerable protein for muscle building and considerable bone-making material. All this must be supplied through the milk of the mother, and if the sow is not given the correct ration, her own muscles and bone tissues are depleted to supply proper elements for the growth of her pigs and the weakened condition mentioned results. This can usually be prevented by giving a food rich in protein and bone making materials along with a corn ration. Protein supplements, such as "tankage" (meat or blood and bone meal), and linseed meal, should be provided. Protein may also be supplied by leguminous crops—clover, alfalfa (lucerne), cowpeas, and soy beans. Brood sows that have access to a feeding rack that is kept full of "pea green" lucerne or other legumes will have no trouble in supplying their pigs with both muscle and bone-forming materials, and will not be in much danger during their lactation period of going down in the hindquarters from too heavy a drain on their tissues. A little crushed wheat or corn and bran made into a slop with buttermilk is an excellent prescription, especially for sows that are low in condition from suckling large litters of pigs. Heat the milk nearly to boiling point for a few minutes before adding the grain constituent; this will prevent any possibility of transmitting tuberculosis or other diseases to the brood sows through cow's milk.

Paralysis from Lumbago or Rheumatism.

A board off the pig pen may permit a cold draught to blow on the back of the pig at night. This chilling of the loins may produce lumbago, or temporary paralysis of the muscles of the hindquarters and inability to walk. Comfortable sleeping quarters prevent these troubles (as well as pneumonia, &c.). It is a mistaken notion that the thick layer of fat with which pigs are provided is sufficient protection against winter storms. On the contrary, pigs often suffer severely from cold and wet if not properly sheltered and properly bedded. If the pigs are affected with lumbago and rheumatism, clean out the bowels by means of a brisk purge (two to four tablespoonfuls of Glauber's or Epsom salts administered in a pint of warm water). Cut down the protein constituent of the ration; feed thin, warm slops to which baking soda is added in tablespoonful doses. Apply hot packs to the loin and paralysed limbs, massage the muscles and apply a stimulating liniment with brisk rubbing. Bed warmly and cover the body of the patient with a thick horse rug if the weather is cold.

A Peculiar Ear Disease Possibly Mistaken for Paralysis.

Reference has also been made on several occasions in these columns to investigations that have recently been carried out by H. R. Seddon, D.V.Sc., and H. R. Carne, B.V.Sc. of the Veterinary Research Station, Glenfield, New South Wales (as reported in the "Agricultural Gazette" of New South Wales), these investigations having as their objective the determination of the cause and effect of a peculiar disease technically known as suppurative otitis affecting the ear of the pig, the principal symptoms of which are the abnormal carriage of the head and the interference with equilibrium and sense of direction. This disease which, unfortunately, also is all too common in Queensland and is frequently mistaken for paralysis or as indicating the development of paralysis of the hindquarters, has been described by these veterinarians as follows:—

A condition has been noticed fairly commonly amongst young pigs in which the most prominent symptom is a peculiar alteration in the carriage of the head, which is accompanied frequently by unsteadiness of gait. The disease is seen usually in young pigs from a few weeks up to three or four months old. The reason for the relative infrequency of occurrence in older pigs is possibly that young pigs are more prone to catarrh (which appears to be the forerunner of the condition) and that affected animals suffer such loss of condition that they die or are killed as "runts" or "bad doers."

Symptoms.

The most characteristic symptoms are the abnormal method of carriage of the head and the interference with equilibrium and sense of direction. The head is twisted or rotated to one side or the other so that one ear (the affected one) is depressed, such depression becoming more marked as the condition advances. It is noticed that the animal, when walking about, tends to circle in one direction, this being towards the side to which the head is depressed. For example, if the left ear is affected, the head will be rotated to the left with depression of the left ear and "circling" will occur in the same direction. At times this tendency to circle is not apparent, but it is noticed that when moving, the animal does so with an awkward gait, whilst the head is moved from side to side in an unbalanced manner. Affected animals may also exhibit considerable difficulty in going straight up to the feeding trough, having to make several attempts before gauging the right direction, sometimes walking to one side of the trough and sometimes to the other. It has frequently been noticed that the condition is accompanied by discharge from the nostrils and eyes.

In advanced cases there are very apparent disorders of equilibrium, the gait becoming unsteady and somewhat inco-ordinated, and the animals may fall into the feed trough and be unable to get out again.

Affected pigs are usually found to be "poor doers" showing a scurfy condition of the skin, lack of lustre of the hair, and poor condition. The appetite is capricious. In some cases examination of the affected ear reveals a considerable amount of yellowish brown or brown sticky discharge adhering to the inner surface of the ear.

Cause and Lesions.

Examination of several pigs showing such symptoms has revealed the presence of a suppurative condition affecting the middle ear, and this may be the only demonstrable pathological change found on post-mortem examination.

The hearing apparatus, it may be mentioned, consists essentially of three parts:—

(1) The external ear, which is that portion visible externally. Its function is to collect sound waves and transmit them by means of a passage to—

(2) The middle ear: This is separated from the external ear by the tympanic membrane or "ear-drum." The function of the middle ear is to magnify the sound waves collected by the external ear and transmit them to—

(3) The internal ear: This consists of an intricate structure by which the sound impressions are transmitted to the sensory areas of the brain. The internal ear, however, performs another very important function—namely, the maintenance of equilibrium, it being by means of part of this structure that an animal keeps its balance. Disease of these deeper structures of the ear, therefore, frequently leads to an unsteady gait, twisting of the head to one side, or even to inability to stand at all.

Both the middle and internal ears are situated within the petrous-temporal bone of the skull and it is within this bone that the lesions responsible for the condition

are found. The petrous-temporal bones are placed immediately behind the articulations of the lower jaws and the skull, but a careful dissection by sawing open the skull along the longitudinal mid-line and removal of the brain is necessary to expose them properly.

In several cases so examined, it has been found that a thick, cheesy material is present in the cavities of the bulbous portion (*bulla ossea*) of the middle ear on that side to which the head has been depressed during life. Normally, these cavities in the bone have a honeycombed appearance, consisting as they do of small, empty spaces separated by thin plates of bone.

The accumulated pus in the middle ear tends to burst through the ear drum and discharge externally, giving rise to the sticky discharge which may, in advanced cases, be seen on examination of the passage in the external ear.

Examination of the pus shows the presence of bacteria, such as are commonly met with in other suppurative conditions in the pig. It is probable that in these cases they gain entrance to the deeper structures of the ear by way of a narrower passage (called the Eustachian tube) which leads from the back of the throat to the middle ear, and from the comparative frequence of nasal catarrh in young pigs, it is probable that this ear disease is an extension of this inflammatory process affecting the lining membrane of the nasal passages.

Prevention and Treatment.

Once the condition is established, it is unlikely that any treatment will be of use. Syringing of the outer ear will remove the obvious discharge, but will not penetrate into the deeper structures from which the pus arises. While the discharge cannot be definitely prevented, all possible means, such as proper attention to cleanliness and housing, should be undertaken in order that chills may be avoided. Diet should also be attended to, as it is found that this also plays a not unimportant part in the causation of those diseases, such as catarrh (snuffles) and pneumonia with which the condition is frequently associated.

More Efficient Feeding Necessary.

As will be noted from the remarks of the authorities referred to above, both in regard to the condition, paralysis of the hindquarters, and to that more recently described by Doctors Seddons and Carne, it is apparent that any form of treatment must be preceded by a general clean up of all the piggery buildings, yards, paddocks, &c., careful attention to breeding, and to the selection of reliable, healthy strains of pigs with which to stock up farm piggeries, to a more efficient system of feeding pigs, and to the use of mineral matters in the food given to pigs of all ages. It will be noted that special emphasis has been given throughout to the consistent use of liberal supplies of green food, lucerne, rape and barley, corn, pumpkins and melons, sweet potatoes and other root crops, grasses, and to any other green foods available on the farm.

Mineral Mixtures.

The preparation and use of mineral mixtures is especially worth attention, for they will be found of great value in all seasons whether the supply of green food is available or not. In this connection the following recipes are suggested as being suited for use on all pig farms; the ingredients are reasonable in price, and are not difficult to obtain, and it should not be difficult for any farmer to arrange for a supply of these very necessary additions to the pigs' diet.

Mix together—Charcoal, 20 lb.; hardwood ashes, 20 lb.; coarse salt, 8 lb.; air-slaked lime, 4 lb.; flour of sulphur, 4 lb.; powdered copperas (sulphate of iron), 2 lb.

Prepare as follows:—First mix the lime, salt, and sulphur thoroughly, then add the charcoal and ashes. Dissolve the copperas in two pints of hot water and sprinkle over the whole mass, mixing thoroughly.

Keep some of this mixture before the pigs at all times in a strong box securely fastened in a weather-proof corner of the sty. Provide ample clean cold water at all times.

Lime water should be added to the morning feed, using half a pint to each two gallons of food. It will also pay to add a few ounces of sterilised bone meal to the food of the growing pig. This meal can be ordered specially for this purpose from any of the leading dealers in artificial fertilisers or from firms like Messrs. Thos. Borthwick and Sons (Australasia) Ltd., Wharf street, Brisbane, who also manufacture meat meal—a protein supplement of much value, and Bonolik, a mineral mixture. It may seem that these condiments are expensive and unnecessary, but in

actual practice they will give a handsome return on the outlay, though it might be difficult to demonstrate this in actual pounds, shillings, and pence.

The provision of these mineral mixtures will satisfy the pig's desire for mineral substances and will prove of added value as a tonic and appetiser. Salt licks, Vita licks, &c., also are now available on the market, and are becoming increasingly popular each year.

Minerals are just as important in the growth and development of the pigs as are proteins, carbohydrates, fats, vitamines, ash, water, and other nutrients, and more attention should be given to their provision, because, as a rule, insufficient quantities are present in the ration.

All pig rations, of course, contain some minerals, but there are practically no pig rations, unless specially prepared, that contain an adequate quantity to meet the requirements of the pig's body. Pigs need minerals for the building up of bone, for making muscle, for cell division, and for carrying on of innumerable physiological functions.

Without minerals, growth and development will be restricted, and the pigs will be less profitable. Many pigs suffer because they receive inadequate quantities of minerals, but no pigs suffer because too large quantities are given to them. Consequently, we should see that our growing pigs have access at all times to a good mineral ration balancer.

Corn Cob Charcoal.

A good use for the corn cobs (cores) that have always been allowed to accumulate on most farms and around piggeries is to make charcoal of them. The cores in themselves do not make a good feed for pigs because of their high and coarse fibre content, and even if the whole cob (corn and core as well) is ground, it has yet to be proved that there is an added value in them. The core is practically indigestible fibre that only burdens the pig's digestive organisation and causes indigestion.

After the pigs have taken all the corn from the cob, however, the waste cores can be raked together into a pile and burned to the point when it is all a live mass of coals. Water should then be sprinkled over the pile to put the fire out, and the partially charred cores gathered up for the pigs. If there are any other "chips" available, or any old corn husks, these should also be gathered and burned, and added to the charcoal made from the cores.

Some of the farmers in the "Rivers" district of New South Wales have for years followed this practice, and in these days when suction gas plants are in use to such an extent, quite a large trade has sprung up for the charcoal burner. In this case large pits are dug in the ground and suitable lengths of logs are pulled into these; they are then fired, and after a time are covered with earth. In a few days' time a good class of charcoal results. These farmers have been making good money, and, at the same time, clearing their holdings.

It pays also to burn all old bones, waste timber, &c., and to thus convert these into a form of charcoal.

Provide More Water.

The water supply should have special attention, for certain it is that many pigs do not have a sufficient supply of clean drinking water, and, as a general rule, pigs from a few days old upwards will be found to appreciate liberal supplies; it is surprising how much water a pig a month old will drink if he has the opportunity of securing a supply.

Careful Handling in Transit.

Many pigs are handled so roughly in transit to market that they arrive at the markets, factories, &c., down in the back or otherwise disabled.

The writer has seen hundreds of cases like this in which the animals have been unable to walk from the railway trucks. The industry suffers heavy losses each year as a result. It should be the duty of every farmer to see that not only his own, but that all other animals in transit to market are handled carefully, and that no undue haste is made in rushing the animals into trucks or other means of conveyance.

The Condition of the Breeding Sow.

Reference has been made above to the fact that frequently breeding sows suffer from paralysis of the hindquarters as a result of loss of vitality and condition from suckling a large litter of thrifty, vigorous pigs. In this regard it is necessary that

the breeder should know the correct condition in which to maintain his breeding sows.

Figures shown represent sows that are too low in condition to farrow and rear their litters successfully. These sows would, in all probability, suffer severely as a result, and their progeny could not be regarded as having the same chance as the progeny of the sows illustrated which represents the normal condition of breeding sows, the condition in which a sow should be maintained for best results; sows that are too fat are likely to have trouble at farrowing time, and their progeny will frequently prove to be weak, puny, and unable to battle for themselves.

The importance of diet and the necessity for careful attention to all details of management are strikingly illustrated in the plate from Henry and Morrison's latest book on "Feeds and Feeding."

Overfeeding Young Pigs on Corn—A Cause of Paralysis of the Hindquarters.

The importance of properly balanced rations cannot be too strongly stressed. Many bacon pigs suffer from paralysis of the hindquarters as a result of being overfed on a ration consisting almost exclusively of corn and water or even of corn and milk; in fact, many authorities condemn the use of corn as a food for young pigs, but the writer's experience demonstrates that, provided corn is fed in comparatively small quantities during the early stages and is well balanced up with liberal supplies of milk, green stuff, &c., that it can be fed to very considerable advantage to all classes of pigs. In these days there is no demand for heavy fat bacon, hence there is no profit in over-feeding pigs on expensive grains, though some grain is necessary, especially in the case of young growing pigs.

Departmental Suggestions.

Paralysis in pigs is brought about by several causes in addition to the other causes referred to above—viz., deficiency of vitamines, &c. In these cases the following lines of treatment are suggested.

Treatment.

If due to rheumatism, see that the pigs are housed at night in a dry place, and allowed to sleep on wood flooring instead of on concrete or earth. Give daily salicylate of soda 15 to 30 grains, and bicarbonate of potash 1 to 2 drachms, in the food or as a drench.

If due to worms give, in the food or as a drench, 1 teaspoonful of oil of turpentine, 20 drops of perchloride of iron, and 3 or 4 oz. of raw linseed oil. This is sufficient for 50 lb. body weight.

It should be given after the animal has been fasting for some hours, and can be repeated several times, with an interval of three or four days. When due to feeding, as mentioned above, stop the corn and give once daily in a mixed diet or in milk 1 dessertspoonful of the following powder for every 100 lb. body weight (after it has been well mixed and powdered):—Sulphur 2 oz., sodium bicarbonate 4 oz., sodium sulphate 2 oz., black antimony 2 oz., sulphate of iron 1 oz., wood charcoal 2 oz.

A useful mineral mixture well worth trial also is made up as follows:—Add 1 dessertspoonful of the following mixture to the food of each pig daily:—Sulphate of iron, 1 part; sulphur, 2 parts; sterilised bone meal, 10 parts. Very young pigs should receive about half these doses. The following excerpt is also of interest in studying this peculiar disease, Paralysis of the Hindquarters.

Causes.

When asked why pigs go down behind and suffer from a form of paralysis, Dr. K. W. Stouder, an Extension Service Specialist at the Iowa State College, U.S.A., said—

Weakness of the legs and back to such an extent that the animal is unable to stand is commonly seen among pigs. It is seen more often in recent years, perhaps, than it was some years ago.

We must not assume that it is all caused by the same thing, nor that all cases are exactly alike. In fact, they can easily be divided into at least two groups, the old sow that goes down and the growing store pig. Most sows do down after suckling a vigorous litter of pigs, and such cases are usually due to a lack of enough minerals, proteins, and vitamines in the rations to support the litter she raises and to provide for her own body-maintenance needs as well.

Many of these cases recover as the experienced feeder knows, if the patient is put on a ration of whole cow's milk every day, as it supplies the deficiencies, but it is more important to remember that this type of going down behind would not have occurred had the food ration been well balanced during the gestation period and while she was suckling her litter.

Young pigs may also go down because of the unbalanced rations, particularly it seems if the ration is low in mineral content and of the vitamines so essential to good health. It may also result from generations of breeding and selection, together with forced feeding for early maturity, rapid gains and excessive fat production, disregarding constitution, good bony framework and vigour. Cases of this kind are common, we believe, and they strongly indicate why these animals and their close relatives should be discarded as breeding animals to perpetuate the herd, for in such cases predisposition has much to do with its occurrence. Its occurrence one generation after another in certain families can thus be accounted for in part at least.

Some animals that go down show deficiency of bone; some show degeneration of nerves that control the muscles of the back and legs; others are found to suffer disease of the bony surfaces that come together at a joint, particularly where the thigh bone attaches to the body. These lastnamed cases of diseased joints may be the result of navel infection during the first few days after birth and could have been avoided had the pig been farrowed in a very clean place and kept under the cleanest surroundings, together with iodine or other antiseptic treatment of the navel until it dried up.

Difficulty of Diagnosis.

The treatment of these cases gives variable results, perhaps depending first upon the difficulty of diagnosing with certainty the exact trouble in each case presented for treatment. Some cases improve on a mineral mixture, especially if given calcium phosphate, and others do better on spoonful doses each day of cod liver oil because the latter is rich in vitamines.

It is suggested that breeding animals and growing animals be given well balanced rations, so far as providing plenty of protein is concerned in relation to the fattening foods; that minerals be kept available and a mixture of equal parts of air-slacked lime, salt, and bone meal by weight serves as good as any.

Preventive Measures.

When young pigs are born, apply tincture of iodine to the naval daily until it is dry. Don't keep even the relatives of the pigs that show this trouble for breeding purposes. When it occurs, give whole milk, cod liver oil, calcium phosphate, and carrots, if you have them available, in addition to a well-balanced ration and some cases will recover, but there are those that never get up though appetite and general health otherwise seem good.

There are cases, of course, in which the ailment is due to accident. The treatment for these cases must be on common-sense lines, and must aim at keeping the animal in good heart and in otherwise healthy condition. There are other cases in which intestinal worms, and possibly kidney worms, are the direct or the indirect causes; these cases must receive a course of treatment that will tend to clear them of the parasites and put them in a condition to battle against future infestation.

Another American authority has this to say on the subject:—

"Professor L. A. Weaver, swine specialist of the Missouri (U.S.A.) Agricultural College, states that the two minerals most frequently lacking in the food for pigs are calcium and phosphorous. Experiments have shown that pigs are able to use these minerals when supplied either in an organic or inorganic form. In other words, ground limestone, which is calcium or lime phosphate, serves as well as a source of phosphorous as does wheat bran, where the phosphorous is in an organic form. Calcium may be satisfactorily furnished in almost any form, such as lime, ground limestone, or bone meal."

Included among suggested remedies by other authorities as well as by our own experience in handling animals in a paralysed condition are as follows:—

Where animals have the benefit of a grazing area, it would be an advantage, if possible, to subdivide this, allowing them to use only one portion at a time, the other portion resting and sweetening up meantime. Where the ground is at all swampy or low lying, some endeavour should be made to drain the area. It is on these low lying, swampy areas where infection from kidney worms or from intestinal worms would be suggested, hence the advisability of changing the pigs from one

pasture to another frequently. Pigs infested with kidney worms, however, seldom recover normal condition, though they may appear perfectly healthy and have good appetites. There is, unfortunately, no external indication of the infestation unless paralysis be accepted as a definite symptom.

Results of Experiments.

A series of experiments carried out at one of the Agricultural Colleges in England demonstrated that pigs fed on an exclusive corn diet have a weaker bone than those having a better balanced ration. If, therefore, animals are receiving corn alone, other foods, especially skimmed milk and green foods (with minerals), should be added to make up the deficiency.

Within the last year or two, a very extensive investigation overseas regarding this disease, has demonstrated among other things that pigs affected with paralysis of the limbs have a broken down condition of the nerves that supply the muscles of the hind limbs with innervation. While it is possible that this is not always the case, still it was found in a large percentage of the patients examined, and as degenerated or broken down nerves cannot be restored to their full function, we are forced to come to the conclusion that paralysis of the hind parts of the pig is, in many cases, incurable. The cause of this breaking down of the nerves is not known, and, therefore, intelligent curative treatment cannot be recommended. Preventive treatment is always somewhat vague, but it is always well to separate the diseased from the healthy pigs, to disinfect all pens by spraying them or by the application by hand of limewash, and by avoiding the use of affected pigs or pigs closely related to them for breeding purposes, as there is some danger that there may be a hereditary predisposition to the disease.

In cases due to accident or injuries, common-sense methods must, of course, be employed in treatment. Meanwhile, the animal requires careful housing and a course of medicinal treatment to keep the bowels and bladder free. The food should be of a soft, nourishing nature. Allow water and green food also.

The use of cod liver oil appears to have the general recommendation of a number of investigators handling paralysed pigs. This oil given at the rate of one teaspoonful per pig (from 6 months old upwards) daily, mixed in the food is suggested.

Another remedy recently suggested in dealing with the disease as one due to a deficiency of mineral matters and to a lack of vitamines, indicates that something needed for nutrition is absent in the foods in use for the affected pigs. The Colorado Agricultural College authorities in answering an inquiry on these lines recently give this advice, "That as the foods being fed to the animals under review had on analyses shown a deficiency of minerals, and were particularly deficient in vitamine B., it was recommended to try feeding the pigs on a ration consisting of plenty of milk and carrots, using new milk for a start and skimmed milk later. Results under experimental work with this ration in case of pig paralysis have been remarkable.

An Incurable Form.

Paralysis resulting from tuberculous bones is incurable, and as the carcasses would not be fit for human consumption the sooner they are destroyed the better. It is, of course, possible to test pigs with the tuberculin test, though this is not a very satisfactory business with pigs for the reason that it must be carried out by a competent veterinarian and the expense incured would hardly be justified except in the case of very valuable stud pigs.

If there is any conclusive evidence that the animal is tubercular, he had better be destroyed immediately and be burned to ashes on the spot on which he is killed.

In addition to paralysis resulting from tuberculous bones, any abnormal condition affecting the spinal cord, such as abscesses tumours, parasites, or even diseased and softened bones may be a primary cause for the trouble. Paralysis immediately following farrowing is, in our experience, not common, but it may result from a weakened condition of the animal and in cases of this description the preventive measures indicated should be adopted, as also in cases attributed to lumbago and rheumatism.

Early Signs of the Trouble.

As a rule, paralysis comes on gradually, being indicated in the first instance by a wobbly, uncertain gait, the animal failing to control its movements, particularly if hurried or if the animal is turning around. Walking gradually becomes more

difficult as the weakening of the nerves and muscles of the hindquarters progresses, but in almost every instance the appetite and general health of the animal is not affected, hence any abnormal change in the appetite or any other indication of sickness must be looked to as premonitory of other and perhaps more serious troubles. Constipation must be relieved by repeated doses of Epsom salts or castor or linseed oils. Massaging of the affected muscles and the application of liniments as referred to above are suggested.

Finally it is suggested that in every instance where the trouble appears in more than one animal, or where it appears that ordinary care and attention is ineffective in bringing about the desired result, the services of a qualified veterinary surgeon should be requisitioned to take complete charge of the case.

PLATE 133 (Fig. 1).

A typical case of Paralysis of the Hindquarters. It will be noted that although paralysed in the hindquarters to the extent that she cannot raise her hind legs or use them in any other way, the animal has not lost condition. Strangely enough, the appetite is not usually affected provided the animal is otherwise normal.

PLATE 134 (Fig. 2).

These pigs are suffering from a very severe attack of paralysis of the hindquarters. The pig on the right is still able to move about but with great difficulty and a very uncertain gait, but as is the case with the other two is quite unable to control its movements. The photograph is of pigs fed on a ration containing a very low mineral content. Stiffness and partial loss of control followed after about six weeks feeding. In the same experiment a second lot fed the same

ration plus five times as much calcium phosphate as lot No. 1 had gained 89 per cent. more weight and were not affected with paralysis. Both lots were afterwards slaughtered. The skeletons of the pigs illustrated in Fig. 2 weighed 1,193 grams. That of the pigs fed in separate pen and which were given sufficient calcium phosphate weighed 2,371 grams, or 100 per cent. more.

PLATE 135 (Fig. 3).

Symptoms of posterior paralysis (breaking down in the back).

PLATE 136 (Fig. 4).

Illustrating a pig that has been injured in transit and unable to travel. Many pigs arrive at our bacon factories and saleyards in such a condition, resulting in their market value being reduced probably 75 per cent. This emphasises the necessity of giving careful attention to the animals in every stage, particularly in transit.

PLATE 137 (Fig. 5).—PIGS SUFFERING FROM SEVERE CASES OF RICKETS.

These pigs received a ration of white corn and skim milk, without pasture. Note the paralysed condition. The pig on the left died within a week after the photograph was taken, while the one on the right gradually recovered when cod-liver oil was added to the ration

(From Henry and Morrison's "Feeds and Feeding.")

These pigs are suffering from an advanced form of the disease Rickets, a similar condition to that referred to as paralysis of the hindquarters. The reference to this illustration emphasises the necessity of careful feeding and the provision of a liberal supply of mineral matters and vitamins in the food.

PLATE 138 (Fig. 6).

These pigs were raised at the Wisconsin Station (U.S.A.) on grain and grain by-products, without pasture or any other food. They became stunted, and finally developed the severe paralysis depicted. The proteins in such a ration are unbalanced in composition; there is a deficiency of mineral matter, especially calcium; and there may be a lack of vitamines. (From Hart, Wisconsin Station, in Henry and Morrison's "Feeds and Feeding.")

PLATE 139 (Fig. 7).

PLATE 140 (Fig. 8).

Figs. 7 and 8 are of farm sows of uncertain breeding too low in condition to prove satisfactory. The young sow in Fig. 7 is too low in condition to mate to the best advantage, while the sows shown in Fig. 8 are too low in condition to rear their young satisfactorily. Sows in such a condition frequently suffer for many months after farrowing, and even if they do not develop paralysis their progeny are more liable to disease and to abnormal troubles than the progeny of sows in medium breeding condition. Sows of the types illustrated should not be retained as breeders as their breeding is doubtful and there are plenty of better type sows available at prices comparatively low.

Fig. 9 is of a Poland-China sow too fat to prove satisfactory as a breeder. She is carrying far too much condition and would be liable to suffer from troubles such as heat apoplexy as well as paralysis. This photograph was taken a few days after this sow arrived from America some years ago. Her condition was in part due to the generosity of the passengers on the same steamer who were anxious that the pigs should arrive in the very best of condition. The sow proved a failure as a breeder largely as a result of this overfattening.

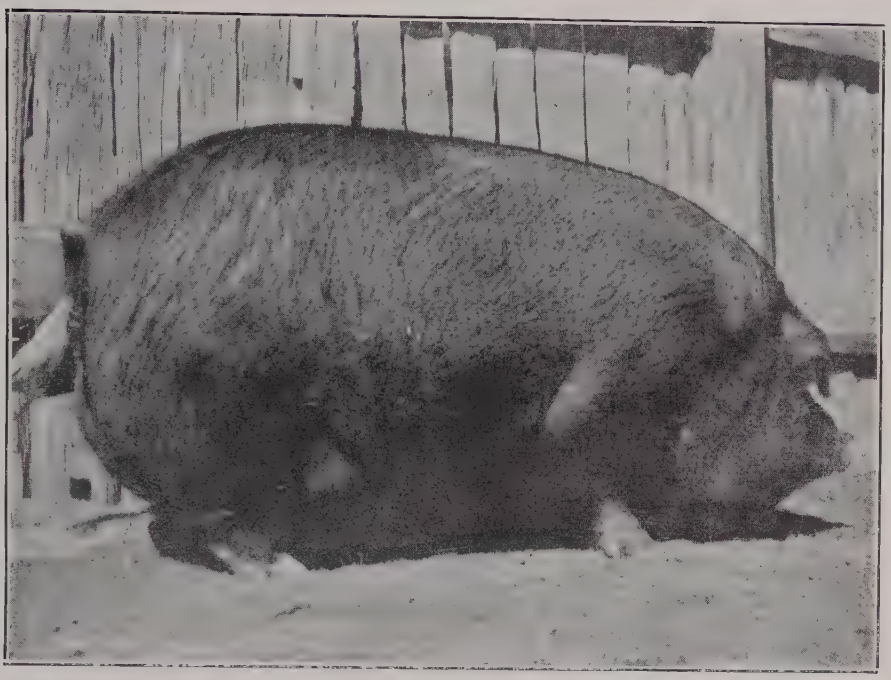


PLATE 141 (Fig. 9).

PLATE 142 (Fig. 10).

Fig. 10 is a prize-winning Gloucester Old Spot sow at the Brisbane Show, 1925. This sow was rearing a large litter of active, vigorous pigs approaching weaning age. She is in ideal condition for a sow at this stage, for it is not to be expected that a sow will hold her condition whilst suckling. This emphasises the necessity of having the sow in proper condition prior to farrowing time in order that she may be able to do justice to her pigs.

PLATE 143 (Fig. 11).—A GROUP OF SELECTED BERKSHIRE BROOD SOWS.
Sows of this description always realise good values in normal seasons, and are worth special care.

Fig. 11.—Berkshire sows in medium breeding condition, the con lition conducive to satisfactory results. This is the ideal condition for in-pig sows, for they will farrow with little or no trouble and be able to rear their litters satisfactorily and without risk of going down in the hindquarters or suffering from other diseases.

TICK PARALYSIS IN PIGS.

A correspondent informed us recently that he had a well-grown, three-months-old sow that had become suddenly very ill; she went off feed and lay down. On rolling her over, the owner found a whitish coloured tick (known as a dog tick), and he sought information as to suitable treatment for an animal so affected.

Another correspondent advised: "I have recently purchased three first-class Middle York sows, three months old. They were in perfect condition when they arrived here, and have been well fed and cared for since, but two days ago I noticed that two of them were suffering from some ailment or other; they would not come up for their food, were very stiff and 'dopey,' and appeared to be getting worse. I am at a loss to know what is wrong or what to do . . ."

The following information was supplied:—The fact that the ailment suddenly manifested itself in the pigs suggests that it may be attributable either to bush-tick poisoning or to severe constipation. The common bush-tick fastens itself on the animal, usually about the head, ears, neck, or under the foreleg, and the poisonous effect of its bite causes a temporary paralysis of the hindquarters (particularly) and frequently severe constipation. These ticks (*Ixode holocylus*) are comparatively common along the coastal districts of New South Wales and Queensland, and one species is found inland. They generally attack dogs, poultry, and pigs; but other animals are not by any means immune, nor even are human beings. After attaching itself to the animal the tick forces its feeding apparatus through the skin (it usually selects a thin-skinned portion of the body for its temporary abode) and commences to suck blood from the affected part. The tick gradually fills up, increases to two or three times its normal size, and at the same time apparently injects a certain amount of poison into the animal, the result being that the animal goes off its food, is disinclined to move from its bed, and when disturbed appears stiff, sickly, and

paralysed, particularly in the hindquarters (later the forequarters may also be affected), breathing becomes laboured, and there may be a discharge from the nostrils; bowels are inactive and severe constipation follows; kidneys and bladder become inflamed and congested, and the urine is scanty and high coloured. If not attended to the animal gradually becomes worse, loses condition, and death occasionally results.

Careful search should be made for the ticks, and if found they should be cut off close to the skin with a sharp pair of scissors, or, better still, with a sharp razor. Do not attempt to pull the tick away. After cutting the tick off, rub the affected spot with antiseptic ointment, kerosene, or Stockholm tar.

Remove the pigs to a pen where they can be attended to regularly. Give each pig two tablespoonsful of castor oil in a half-cupful of warm milk as a drench immediately. About three hours after give each pig a mixture of one dessertspoonful of aromatic spirits of ammonia and ten drops of nux vomica (the chemist will make this up for you) in a small cupful of warm milk.

Compel the animals to take exercise; provide dry and warm, clean sleeping quarters, and treat the patients kindly for a few days. Give soft nourishing foods—milk, pollard, a bran mash, and similar foods.

Another remedy that has proved successful is as follows:—Give castor oil or olive oil as already advised, and an hour later give six drops of tincture of aconite each in a small quantity of warm water. Three hours later, if the patients have not recovered, give three drops of the same drug and repeat until four doses have been given; do not give more than four doses. Follow the instructions with regard to feeding and housing.

GROS MICHEL BANANAS.

This variety was introduced by the Acclimatisation Society, Messrs. Howard Smith and Sons, and this Department. Howard Smith's established a plantation in Mourilyan district.

Plants were propagated from single eyes from the departmental introduction and planted in various parts of the State, but for pertinent reasons were not considered suitable for general planting. Howard Smith's plantations were completely devastated by a cyclone (the Gros Michel is a very tall-growing variety). Mr. Hogg, Cardwell, propagated sufficient stock to plant several acres and found the variety difficult to handle, the psuedo stems each requiring support when bunching. Afterwards, a cyclone practically eliminated them.

Thrip is a pest in parts of North Queensland, and to dust the young fruit as required for this pest would mean carrying a step ladder to provide access to the bunches. The detrimental influences of high winds on this variety are severe and those of a cyclone are complete demolition. For this reason the Gros Michel has practically gone out of cultivation in Fiji and has been superseded by the dwarf-growing Cavendish.

The Gros Michel being essentially a tropical variety makes comparatively slow progress in the South. Its fruit being less curved has the advantage in packing and to some extent also in size, but under equally favourable conditions the weight of fruit from a given area is in favour of Cavendish, which also comes into bearing much earlier than any of the tall-growing varieties.

Possibly the Gros Michel may be a better carrier, but regarding the Southern Queensland product, it must be remembered that we are producing a tropical fruit under sub-tropical conditions. The effect may be gauged from the fact that bananas from Currumbin were found unfitted to rail beyond Melbourne, whereas they were satisfactorily sent to that destination from Cairns (also to Adelaide, though the latter were packed in a decidedly green stage).

That the Gros Michel is subject to "Panama disease" is a serious matter for consideration. This disease practically wiped out the Sugar banana, and has seriously influenced the production of the Lady's Finger variety. It may also be mentioned that an American investigator, Dr. Reinking, recently visited Queensland in search of a tall-growing banana, which was not susceptible and possessing a more sturdy stem to supplant the Gros Michel. Observation and experience suggest the Cavendish variety being quite immune from the disease, and its dwarf habit distinctly favours its planting. Before general planting of the Gros Michel can be recommended, even in the most favoured and sheltered northern districts, it should receive further trial, and this not exceeding 25 per cent. of the area of any plantation.—G. W. Williams, Acting Director of Fruit Culture.

PUBLICATIONS RECEIVED.

PIG TESTING AND RECORDING FOR THE PURPOSES OF ADVANCED REGISTRY.

In an extremely interesting and informative brochure under this heading from the pen of Messrs. H. R. Davidson, M.A., Dip. Agric. of the School of Agriculture, Cambridge, England, and A. D. Buchanan Smith, M.A., M.Sc., of the Animal Breeding Research Department of the University of Edinburgh, an extensive outline is given of recent developments in animal breeding in its relationship to the registration of stock and the recording of pedigrees generally.

Though written by authorities exceptionally well versed in the scientific aspect of stock breeding and dealing with a technical subject, "Pig Testing and Recording" is extremely practical, and is written in a way that will readily be understood by producer, student, and expert alike.

In the opening paragraph attention is drawn to the belief that "the full benefit of the recently elaborated science of genetics or breeding will not be obtained until some standards of production are established . . . . That while the pail (or milk bucket) is the chief measure of the productivity of the cow, there are other things which must be considered before her value can be rightly gauged. With the hen the number of eggs laid during the year does not convey an adequate impression of the economy of any particular fowl. All the same, "to have any sane standard of production" (says the author) "is better than to have none. To have a standard that is easily measured gives the breeder of that type of stock a great advantage."

After stressing the importance of the great progress made in breeding practice within the past fifteen years, and after comparing results and urging an extension of the practice not only to the cow and the fowl but to the pig . . . . which next to the dairy cow is the most economical producer of food . . . . readers are supplied with a brief historical record of this progress and of the inauguration of a permanent system of stock recording and registry, and the latest extension of this scheme to recording not only the pedigree but the productivity of the pig. A pig with a pedigree, it is said, implies that it is aiming at something higher than the average. A pig with a record implies that it has achieved something hgher than the average.

Origin of Pig Testing and its Development Abroad.

Pig testing as at present understood appears to have originated in Denmark, where in 1896 the first tests of thriftiness and quality were carried out on the farms of the breeders. In 1907 the first testing station was opened in that country, and since then two more have been established in different parts of the country. Some time previous to the introduction of testing, the Government had instituted a number of subsidised "breeding centres," something on the lines of the poultry stations in the British Isles, and in view of the rather strict supervision of these herds by State officials very full information relating to the breeding capacity of the stock was obtained by means of detailed private herd registers. The type testing station added to this breeding information details of the carcass quality and the economy of food consumption.

The small size of Denmark and the way in which the breeding centre scheme was organised resulted in the fact that a great part of the pigs fed commercially in the country originated from the breeding centres, and so the live stock authorities have been able in this way to keep considerable control over fecundity (the power to produce thrifty litters freely, regularly, and abundantly), quality, and thriftiness of the commercial pigs used throughout the country.

After drawing attention to the difficulties that would be experienced in Great Britain in inaugurating similar type testing stations, &c., the authors proceed to discuss the position in Sweden where the system has also been in successful operation. In general the methods followed in Sweden and the station established there has been "modelled very closely upon the Danish ones," and although only completed in 1923 it has already produced three most interesting reports.

A perusal of the results published indicates that "productivity" not only refers to increased production of "typy" pigs, but that considerable attention has been given to grading of the finished product, this grading having special reference to length and depth of side, measurement of back fat, thickness of side, &c. The fact that even in grade III. the back fat was only 1.80 inches suggests that sides with anything more than 2 inches of back fat are not good enough to be exported from Sweden.

Attention has been given also to thickness of belly, the objective being to increase the streakiness and commercial value of this portion of the carcass especially in its relation to the "side." Especially interesting is a comparison between hog meat (the meat from a castrated male) and gilt meat (the meat from a sow pig). When all the pigs are divided in this way, it is found (the authors say) that in the gilts (sows) the back fat is thinner and the streak thicker than in the case of the hogs. One interesting suggestion is made in this connection, and that is—that as the hogs grow rather faster and fatten at an earlier age it is conceivable that they might be used to best advantage for pork while the gilts could be kept back for bacon. Another interesting conclusion is stated in that with regard to depth of side the figures show that 59 per cent. of deep pigs are placed in grade I. as against 23 per cent. of the shallow ones, but what is perhaps more unexpected is that the deep pigs turn out to be also the long ones. The authors add that it is in view of the applicability of these results to pig breeding in general and the possibility of further useful information being obtained in the way that we think the Swedish type testing station results are so interesting.

References are also made to the pig testing stations of East Prussia and Hanover in Germany, at which valuable work is being carried on. In Canada and also in the United States of America numerous experiments have been carried out and much valuable data recorded; these experiments are of an intensely practical nature, and include the "Ton Litter" scheme, through which so much has been done to popularise pig production. That the Ton Litter Contests have done good by attracting attention to the need for some more accurate measure of pig production cannot be denied. Space is given in the report to the judging and recording of utility points, to carcass and bacon competitions, to pig recording schemes in Great Britain, to a criticism of present methods in re type testing stations, and pig breeding societies. References are made in the conclusions formed to (*a*) Government grading of pigs, (*b*) pig recording societies, (*c*) type testing stations, and of (*d*) proposed schemes for the extension of operations in England. Finally an outline is given of "How to start and develop the scheme."

"Pig Testing and Recording" is a most informative and useful record which we recommend to the consideration of every pig producer. Copies may be obtained from the National Pig Breeders' Association, 92 Gower street, London W.C.1.

THE 1927-28 "PIG BREEDERS' ANNUAL."

The seventh volume of the "Pig Breeders' Annual and Year-book," recently to hand, and published by the National Pig Breeders' Association of England, to whose courteous secretary (Mr. Alex. Hobson) we are indebted for copies, is one of the most up-to-date publications of its nature we have yet received. The "Annual" is in itself quite an attractive and up-to-date publication, profusely illustrated, covering 180 odd pages, packed full of interesting and informative matter of value to the up-to-date farmer in his every-day round of duties.

A feature of the volume is its information on many of the leading studs of the old world and of people interested in the preparation of meals, measures, and medicants, such as have been found to be of value in encouraging more rapid growth and earlier maturity in the several grades of pigs for which they are prepared.

Sir Daniel Hall, K.C.B., LL.D., D.Sc., F.R.S., in a thoughtful and informative foreword refers to the importance of "type" in the production of various grades of stud stock.

"The criticism," he says, "is often made that we have too many breeds of pigs in Great Britain." In this way he sets up a useful argument which, while favouring the bacon type as far as market pigs are concerned, does not necessarily condemn any particular breed or cross. It is certainly true that to be successful in marketing pig products in any part of the world, market requirements in the way of type, quality, and quantity must be kept strictly in view.

Professor Basil Buxton, M.A., F.R.C.V.S., contributes a useful and well-written article on "Some Parasitic Diseases of Pigs," which every farmer would do well to carefully study.

Major E. R. Orme, Marketing Investigator for the Ministry for Agriculture and Fisheries, selects for his theme "The Need for Organisation in the Pig Industry," and draws a useful comparison between past failures and future prospects in this most important branch of husbandry. His comparisons between the Danish and English conditions are very instructive, and his conclusions are based on a wide knowledge of the subject gained, we are sure, from a field much wider than those to which he makes reference in his report.

Agricultural Shows is the subject chosen by Mr. W. F. S. Hodgson, his discussion being along the lines as to whether they can be improved from the pig exhibitors' standpoint.

Messrs. John Golding, D.S.O., F.S.C., and W. B. Morris, B.Sc., devote their space to a discussion on "Some Experiences in the Course of Pig Feeding—Experiments at the National Institute for Research in Dairying," experiments by the way that have led to numerous important suggestions being brought forward for the benefit of readers generally.

"The British Pig Producer V.—The Dane" is the subject on which Wm. Todd, M.A., has some interesting conclusions to discuss. His arguments are sound and well worth careful study.

In a very thoughtful and detailed report Messrs. H. R. Davidson, M.A., Dip. Agric. of the School of Agriculture, Cambridge, and A. D. Buchanan Smith, M.A., M.Sc., of the Animal Breeding Research Department, University of Edinburgh, discuss "Pig Testing and Recording for the Purposes of Advanced Registry."

These authorities are so well and favourably known, and their writings are appreciated by such a wide circle of readers, that their opinions on this most important subject will form a topic for conversation and be appreciated by readers in every part of the world.

"The Potentialities of the English Co-operative Bacon Factory Movement" are discussed in detail by Mr. F. J. Suhr.

The reference to the "Standardisation of the Pig" is especially worthy of note. On the production side of the business, and dealing more particularly with English conditions, Captain Godfrey Phillimore, M.A., suggests ways and means "How to avoid a loss with Harley meal at £12 a ton and bacon at 13s. 6d. a score." To Australian pig farmers this article is a revelation, and will be perused and discussed with more than an ordinary share of interest.

"Judging Pigs in South America," by Mr. W. V. Judd, will be read with interest, as also will the detailed discussion by Mr. John Hammond, M.A., on "Growth and Conformation in the Pig." Mr. Hammond is associated with the Animal Nutrition Institute of the School of Agriculture, Cambridge, and is a well-known authority.

"Pig Production in Norway," by Mr. O. C. Hersoug, with its informative illustrations and useful comparisons, throws light on the successful attempt of the Norwegian people to make pig farming a profitable venture there.

Referred to as one of the greatest living authorities on all questions pertaining to costings, accounts, &c., Dr. Arthur G. Ruston, D.Sc., of the Leeds University, discusses at length and in complete detail "The Economic Value of Pigs on the Farm," an article worth a special place in the library of every farm whether he be specially interested in pigs or otherwise.

"The Development of the British Pig Industry," to which Mr. Jas. H. Stansfield makes extended reference, is of special interest in that it draws attention to the immensity and importance of pig raising, not only in the British Isles but in other parts of the world. The fact that Great Britain spends annually £60,000,000 sterling on the purchase of pig products indicates that Mr. Stansfield has a very large subject on which to work.

"Railway Rates for the Carriage of Pigs," by W. Hallas, a well-known authority on these matters, gives a great deal of useful information condensed into a very small space that has special reference to conditions in the old world more than to countries overseas. Nevertheless, the article is not without interest even in overseas dominions where also pigs are carried by rail over many thousands of miles.

"Pig Breeding in Australia," by Mr. E. J. Shelton, H.D.A., Instructor in Pig Raising to the Department of Agriculture and Stock in Queensland, will be read with special interest by a wide circle of readers. The article discusses the development of this industry under Australian conditions, and the possibilities of export of pig products to markets outside her own borders, as well as to an extension of local markets throughout the Commonwealth. Mr. Shelton is well known throughout Australia as an authority on this subject, and invites correspondence from interested readers in any part of the world.

"Wye College Pig Husbandry Research Centre," as discussed by Mr. V. C. Fishwick, P.A.S.I., N.D.A., N.D.D., describes the operation and experiments carried out at this important centre of activity, and is of interest.

"The Breeding of Commercial Pigs" on a mixed farm by P. Webster Cory, and "Pig Breeding of Yesterday and To-day" by Mr. C. L. Coxon, are both articles from the pen of practical husbandmen which will be read with interest.

"The Advantages and Simplicity of Weekly Weighings," by Captain C. L. Stiff, is especially worth careful note, for only by detailed attention to this most important part of the business can the farmer hope to secure the maximum reword for this industry. The very fact that the job is such a simple yet such an important one will appeal and open fresh avenues of thought in the minds of many pig farmers.

"The Pig Breeders' Annual" is recommended to every pig producer. Published at 92 Gower street, London W.C. 1, copies may be obtained through booksellers or direct from the secretary.

Photo.: Dr. L. St. V. Welch.]

PLATE 144.—CITRUS FRUIT IN THE WEST.

A prolific Lisbon lemon-tree in the Station garden on "Retreat," the property of Messrs. Button Bros., near Jundah.

"MUST HAVE THE JOURNAL."

Writing from Rose Hill, a farmer subscriber says: "I enclose postal note for 3s. for which please send me the 'Queensland Agricultural Journal' for a further three years.

"A farmer requires to keep in touch with all the latest scientific methods, and to do this he must have the Journal."

Answers to Correspondents.

Destruction of Weeds in Banana Gardens.

P. C. (Mount Pelion)—The Agricultural Chemist, Mr. J. C. Brünnich, advises:—

Dissolve 4 lb. of grey arsenic with the aid of 2 lb. of caustic soda in a kerosene tin in a few gallons of water and make up to 100 gallons for spraying The mixture will only kill succulent weeds.

Bone Crushing.

H.N.R. (Woombye)—Your inquiry regarding the crushing of bones without a mill was referred to the Agricultural Chemist, Mr. J. C. Brünnich, who advises:—

(*a*) Pack bones layer by layer, with fresh wood ashes, in a barrel, and keep moist with water for several months.

(*b*) Boil bones in copper or iron boiler with caustic lye for two to three hours; 15 parts of bones, 5 parts of caustic soda dissolved in 15 parts of water. Bones can also be left to stand in lye liquor for a few weeks.

(*c*) Mix bones in heaps with quicklime. Make a layer of loamy soil 4 inches deep, followed by a layer of bones 6 inches deep, and covered with a layer of quicklime (not slaked lime) 3 inches deep. Then layers of loam, bones, and quicklime until convenient height is reached and the whole is covered by a thick layer of soil. Holes are bored in this top layer of earth and water poured in, and the whole left for three or four months.

BOTANY.

The following replies have been selected from the outgoing mail of the Government Botanist, Mr. Cyril White, F.L.S.:—

Tea Trees.

Inquirer (Brisbane)—

Neither specimen sent represents *Melaleuca Irbyana*. It is rather a difficult matter to name Tea Trees from leaves only, but we should say that the big tree is *Melaleuca bracteata* (the River Tea Tree) and the shrub, *Bæckea virgata*.

Plants from Yarraman Identified.

Inquirer (Brisbane)—The specimens from Yarraman have been determined as follows:—

M.A.R.

108. *Exocarpus latifolius*. Broad-leaved Cherry.
109. *Solanum discolor*. Devil's Needles.
110. *Dendrobium teretifolium*. Pencil Orchid.
111. *Dendrobium gracilicaule*.
112. *Brachychiton populneum*. (Syn. *Sterculia diversifolia*)—Kurrajong.
113. *Dodonæa cuneata*. A "Hop Bush."
114. *Cupania Xylocarpa*. A "Foam Bark."
115. *Duboisia Leichhardtii*. An interesting species intermediate between the Pituri (*D. Hopwoodii*) and Corkwood (*D. myoporoides*).
116. *Turræa pubescens*.
117. *Cleistanthus Cunninghamii*.
118. *Tarrietia Argyrodendron*. Booyong.
119. *Nephelium tomentosum*.
120. *Canthium vacciniifolium*.
121. *Marlea vitiensis*.
122. *Cupania anacardioides* var. *parvifolia*. Sometimes called "Tamaran," but I do not know the origin of the vernacular; perhaps it is a corruption of "Tamarind."

Yellow Pea *(Cassia notabilis)*.

INQUIRER (Brisbane)—

The specimen is *Cassia notabilis*, a species of "Yellow Pea" or "Wild Senna." It is apparently not very common in Queensland, as we have only previously received one specimen, collected many years ago by E. J. Whelan on sand ridges near the Georgina River. Its properties are not known, but the genus is widely spread over the warmer regions of the world, and a number occur in Queensland, some of them bad weeds. Most are more or less purgative, and "senna leaves" of commerce are the product of several species.

Dogwood—Snake Weed—Rush Lily—Bitter Bark.

G.P. (Rockhampton)—Your specimens have been determined as follows:—

No. 1. *Jacksonia scoparia.* Dogwood.

No. 2. *Stachytarpheta dichotoma.* Snake Weed. A malformed specimen of a plant very common as a weed about Rockhampton. The malformation is probably due to insect attack.

No. 3. *Xerotes multiflora.* Rush Lily. Rather an anomalous member of the lily family (Liliaceæ).

No. 4. *Alstonia constricta* var. *mollis.* Commonly known as Native Cinchona, Quinine, or Bitter Bark; see leaflet enclosed herewith dealing with the plant.

The Tea Plant.

H.H. (Brisbane)—

The specimen forwarded from Barrine, North Queensland, is *Camellia Thea,* the tea plant. An odd bush or so of commercial tea is to be seen growing here and there in Queensland. There are, however, a good many cultivated varieties, and what the particular one sent is we cannot say. We have not tasted tea from Queensland-grown bushes.

***Sida corrugata*—"Bindey-eye"—Cochineal Infested Pear.**

J.R.B. (Roma)—The specimens were very much eaten, but seemed to represent only two species:—

Sida corrugata, a common weed of the mallow family, eaten freely by stock, and quite wholesome; and

Bassia quinquecuspis, a species of "bindey-eye," rather indigestible, but otherwise harmless.

Cochineal infested pear is not known at present to be poisonous.

SHEEP AND WOOL.

Selected from the outgoing mail of the Assistant Instructor in Sheep and Wool, Mr. J. Carew:—

Sheep Fattening.

G.A.P. (Sandgate)—

For grazing purposes the most suitable crop to grow for fattening purposes generally is lucerne, as it gives a longer grazing period than any other crop, but is rather particular regarding soil. The decomposed granite soil is not well adapted for its growth as compared with heavier loams. Rape and mustard make an excellent fattening crop for sheep, but is only suitable for winter and spring feeding, this with panicum (white) or sudan grass for summer and autumn grazing should be very successful. Wheat and field peas, oats, and barley are also useful. An addition of a few ounces of whole maize per sheep per day with any of the above will be found very beneficial. Giving those sheep to be fattened free access to the crops is the most economic method of fattening. Mr. Brünnich's pamphlet on Stock Foods forwarded.

PIG RAISING.

Selected from the outgoing mail of the Instructor in Pig Raising, Mr. E. J. Shelton, H.D.A.:—

Castration Risks.

E.A.H. (Guluguba)—

The death of the young pig was probably due to complications resultant upon castration; blood poisoning was apparent by the immediate cause, this possibly being due to the use of an unclean knife or to the open wounds becoming infected from the soil in the yard. Deaths of young pigs following castration are also sometimes due to loss of blood, weaking the animal to such an extent that recovery is impossible. Then again, sometimes through the pig being very ill and indisposed to move about and the bowels becoming clogged. It is not, of course, impossible for a castrated pig to become infected with the bacillus of Tetanus. If the bacillus of this disease found entrance through the open wounds, death would probably rapidly ensue.

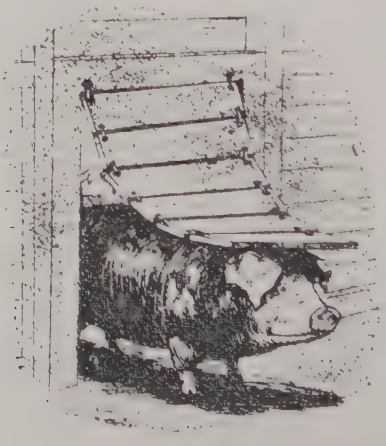
Paralysis in Pigs.

F.W.R. (Kingaroy)—

Tick paralysis in young pigs may be caused by the young pigs becoming infested with bush ticks. Of course, young pigs that suffer from severe diarrhœa or white scour are often very stiff and practically paralysed as a result of weakness of the hindquarter. Where pigs (particularly young pigs) are suffering from constipation, there will also often show indications of paralysis. Young pigs also sometimes suffer from a form of rickets and from heat apoplexy, of which partial paralysis are characteristic symptoms; the former, the result of lack of mineral matters and vitamines in the food, the latter the result of exposure. It is very difficult to definitely diagnose without inspection. Provide ample drinking water and green food, also charcoal, wood ashes, lime water, bonemeal, &c., as all these are valuable yet inexpensive additions to the pig's diet.

SECTIONAL SWINGING DOOR.

A sectional hanging door for the pig sty, as shown in the drawing, will keep fowls out but will not hinder the pigs. Cut a 6-inch board in lengths equal to the width of



the door. Two holes are drilled in the ends of each board so that they can be wired together and the assembly hung in the doorway as shown.—"Popular Mechanics."

General Notes.

Hail Insurance.

The Regulations providing for the Hail Insurance Scheme under the Wheat Pool Acts have been amended.

Staff Changes and Appointments.

The appointment of Mr. E. J. Lorraine as Inspector under the Diseases in Plants Acts, Brisbane, has been confirmed as from 4th March, 1927.

Mr. W. A. R. Cowdry, Cadet Grader, Cotton Section, has been appointed Assistant Cotton Grader (Junior), Department of Agriculture and Stock.

Constable D. Dwyer, South Kolan, has been appointed Inspector of Slaughter-houses.

The following have been appointed Officers under and for the purposes of the Animals and Birds Acts:—Mr. M. Harland, Upper Cedar Creek, via Samford; Mr. C. F. Driver, Brisbane; Mr. N. James, Upper Cedar Creek, via Samford; Miss E. E. Bowton and Mr. F. K. Bowton, Inveragh, North Coast Line; and Mr. M. E. Joyce, Townsville.

The resignation of Mr. Jas. Hutton as Member of the Egg Board has been accepted as from 30th September, 1927.

It has been approved that Mr. L. P. Doyle, Inspector of Stock, Cooyar, be transferred to Cloncurry, and that Mr. D. Culhane, Inspector of Stock, Ravensbourne, be transferred to Cooyar.

Mr. J. C. Pryde has been appointed Temporary Inspector of Slaughter-houses, Toowoomba, as from 5th October to 16th November, 1927.

Constable R. Hamill, of Stanthorpe, has been appointed Inspector of Slaughter-houses.

Mr. J. D. Irving has been appointed Cane Growers' Representative on the Tully Local Sugar Cane Prices Board, vice Mr. F. H. Gilmore, resigned.

The appointment of Officer in Charge, Police, Evergreen, as Acting Inspector of Stock, has been cancelled, and the Officer in Charge, Police, Peranga, has been appointed Acting Inspector of Stock.

Egg Board Election.

Mr. A. H. Jones, Returning Officer, Department of Agriculture, advises that nominations will be received by him for the Egg Board Election, care Department of Agriculture and Stock, Brisbane, until the 24th November, 1927, for election for one year from the 1st January, 1928, as Growers' Representatives on the Egg Board Five such representatives are to be elected by growers as defined in the Order in Council of the 14th January, 1926, appearing in the "Government Gazette" of the 16th January, 1926. Each nomination is to be signed by at least ten growers of eggs.

The following districts shall return one representative:—

No. 1 District.—The Petty Sessions Districts of Bundaberg, Gin Gin, Mount Perry, Eidsvold, Childers, Maryborough, Biggenden, Gayndah, Tinana, Gympie, Kilkivan, Wienholt, Nanango, Maroochy, Caboolture, Woodford, and Kilcoy.

No. 2 District.—The Petty Sessions Districts of Redcliffe, and that portion of Brisbane north of the Brisbane River.

No. 3 District.—The Petty Sessions Districts of Wynnum, Cleveland, and that portion of Brisbane south of the Brisbane River.

No. 4 District.—The Petty Sessions Districts of Logan, Southport, Nerang, Beaudesert, Goodna, Ipswich, Lowood, Esk, Marburg, Harrisville, Dugandan, Rosewood, Laidley, Gatton, and Helidon.

No. 5 District.—The Petty Sessions Districts of Toowoomba, Clifton, Pittsworth, Allora, Warwick, Killarney, Inglewood, Texas, Goondiwindi, Stanthorpe, Highfields, Crow's Nest, Oakey, Goombungee, Cooyar, Jondaryan, Cecil Plains, and Dalby.

To ensure their names being on the roll, persons owning fifty or more domesticated fowls are invited to send their names for inclusion on the roll of persons eligible to vote.

The election, if any, will be held on the Thirty-first day of December, 1927.

North Queensland a White Man's Land.

Thus a Victorian settler on the Atherton Tableland, writing to a friend in his home State:—"The climate here is a revelation to me. There is nothing better in the world. The altitude makes it an ideal white man's country. . . . I have a grand lot of men working for me; never had better. They are long, loose fellows, splendid workers; a fine crowd personally, and easy to handle. They are nearly all Australian-born. I fear that in Victoria we look at Queensland with a lot of political bias."

More Sanctuaries Proclaimed.

The following properties, &c., have been declared sanctuaries for animals and birds:—

(1) Timber Reserve (R. 6), and portion 47, parish of Eungella (property of D. A. Parker), on the western fall of the Eungella Range, Mackay.

(2) Reserve for Scenic Purposes, No. 85, Cania Gorge, Gayndah.

(3) Grounds of St. Faith's School, Yeppoon.

(4) Properties of Dr. A. J. Marks, Mr. M. Harland, Messrs. C. F. Driver, N. James, and Mrs. E. R. Prentice, and Miss M. A. Burley, Upper Cedar Creek, viâ Samford.

Central Sugar Cane Prices Board.

The following nominations have been received for the position of Canegrowers' Representative on the Central Sugar Cane Prices Board:—

P. J. Hoey,
G. H. D. Plant,
T. A. Powell.

A poll will take place on the 12th November. The sitting member is Mr. Powell, and the person elected will hold office for three years.

Crate Packing of Bananas—A Correction.

Mr. William Leslie, Assistant Instructor in Fruit Culture, writes:—

Reference Note on Crate Packing of Bananas as in the October Journal—Under Plate 97 the descriptive matter reads in the third and fourth line

"Four head-pieces $\frac{5}{8}$ in. x $\frac{2}{3}\frac{3}{7}$ in. x $2\frac{1}{2}$ in.
Four head-pieces $\frac{3}{8}$ in. x $\frac{1}{1}\frac{3}{7}$ in. x $2\frac{1}{2}$ in.,"

and under Plate 98—

"Eight head-pieces $\frac{5}{8}$ in. x $\frac{1}{1}\frac{3}{7}$ in. x $2\frac{1}{2}$ in."

In the double case (Plate 97) the head-pieces should be from 22 to 27 inches and from 12 to 17 inches long respectively, and your copy reads as if these numbers meant fractions of an inch. Likewise in the single case (Plate 98) the head-pieces should be from 12 to 17 inches in length according to the dimensions of the bunch to be packed.

Queensland Butter at Islington—Warwick Wins.

The Minister for Agriculture and Stock, Mr. W. Forgan Smith, informed the Press recently that he was highly pleased to read of the further success of a Queensland factory at the important Dairy Show at Islington, London. The competition was open to the whole of the Dominions, and exhibits were staged from New South Wales, Victoria, Queensland, South Australia, New Zealand, Canada, and South Africa. In all there were eighty-three entries in the class, won by Queensland. The Minister desired to congratulate the management of the Warwick Butter and Dairying Association on their success in gaining first prize honours in such a strong competition. The result provides further evidence, if such were necessary, of the high quality of Queensland butter, and to secure 97 out of a possible 100 points, indicates that in the opinion of the judge the manufacture and quality of the butter were almost perfection. These butters would be judged after a lapse of about two months from the time of the actual churning of the cream, and the points awarded testify to the splendid keeping quality of the butter.

The Minister mentioned that the Warwick Butter and Dairying Association recently re-erected their factory on modern lines, fitted with the latest and most up-to-date machinery, and its success shows the material advantages that accrue through the installation of appliances of the latest design in factory equipment.

Bird and Animal Sanctuaries.

The following have been declared sanctuaries under and for the purposes of the Animals and Birds Acts:—Curtis Island, north of Gladstone; Pasturage Reserve (R. 129), Townsville.

Rural Schools—Training Brains and Hands.

This is what a Southern paper, "The Farmer and Settler," had to say of the exhibit of the Queensland Rural Schools at the last Brisbane Show:—

"Visitors to the Queensland show could not help being impressed with the value of the teaching given at the rural schools. Twelve of these schools are now established in Queensland—at Beenleigh, Boonah, Clifton, Gayndah, Gordonvale, Home Hill, Imbil, Malanda, Marburg, Murgon, Nambour, and Stanthorpe—and, though expensive to equip, judging by the high standard of excellence of the work displayed this year, they are well worth the cost. The rural school is going to help the bush boy and girl to a new interest in life, to love the life on the land, and to use their hands and their brains to the fullest extent and for the best purposes. Specimens of work in metal, leather, wood, and chemistry—soil fertilisers, and so on—from the boys, and in cookery, dressmaking, and, indeed, all branches of domestic science from the girls formed one of the best collections at the show. A saddle, a model portable piggery, stockyard—gates and all complete—watering cans and every household utensil in tinware, ploughshares and chains, bookcases and chairs, even a bed, all the work of country boys. The same degree of good workmanship was shown in the girls' section, and a remarkably clever exhibit in the cookery section was a wedding cake that had been made by one of the country girls. Nearby were dishes of sweets, cheese straws, cakes, pickles, and jams. Dressmaking and needlework were of the highest standard, and in consequence it may be safely considered that bush girls are being taught at our rural schools along the right lines to be the mothers of Australia of to-morrow."

4QG and the Farmer.

A commendable feature of the services provided by 4QG is the consideration given to people resident outside the metropolis. Too often city dwellers are prone to forget that outside the city environs there are thousands of men and women engaged in agricultural pursuits upon which the prosperity of our State largely depends.

Isolation from the big centres of population is a severe handicap to those who reside in the great open spaces, and no effort should be spared to make their conditions as bright and comfortable as possible. Now and again a listener-in writes 4QG complaining about the time taken up in the broadcasting of market and weather reports, news items, and agricultural lecturettes, but, fortunately, the big majority of city listeners realise the importance of such services to the man on the land.

The policy of 4QG is to cater for all sections of the community. City folk must not forget that whilst they are (in most cases, at any rate) in receipt of an assured income, the income of the man on the land is governed by the rise and fall of markets, weather, &c.

It is for these reasons that 4QG employs a specially qualified officer, Mr. Robt. Wight ("Market Reports"), to attend agricultural sales, collect market data, arrange agricultural lecturettes, and generally, look after the welfare of the country listener.

Fur Farming in Canada.

Even in the early days of the fur trade in Canada it was the practice for trappers to keep foxes caught in warm weather alive until the fur was prime; from this practice has arisen the modern industry of fur farming. The industry is devoted chiefly to the raising of the silver fox, a colour phase of the common red fox established through experiments in breeding carried on by the pioneer fox farmers. There are now in Canada 2,130 fox farms with a total of 42,125 silver foxes, 1,736 patch or cross foxes, 1,196 red foxes, and 735 blue foxes. There are also 210 farms raising fur-bearing animals other than foxes, chief among which are mink, racoon, skunk, and muskrat. The value of fur-bearing animals on farms in 1925 was 9,898,019 dollars, the value of those sold off in that year being 2,897,270 dollars. In addition, the value of pelts sold from fur farms in 1925 was 781,383 dollars, this representing about 4 per cent. of the total value of the fur production of Canada in that year. The exports of furs from Canada in 1926 were valued at 17,017,507 dollars.

Cheese Board.

The Order in Council constituting the Cheese Board and published in the "Government Gazette" of the 16th July, 1927, has been amended by the insertion of a further paragraph, providing that all moneys due by factories for equalisation purposes shall be paid to the Cheese Board by agents of such factories.

Amended Cheese Selling Rule.

Rule No. 10 of the Cheese Selling Rules, published in the "Government Gazette" of the 19th February, 1927, has been amended. The Rule now provides for the maximum commission payable to agents for the sale of cheese, not to exceed 5 per cent. The maximum previously was 4½ per cent.

Northern Pig Board.

Nominations will be received by the Returning Officer, Northern Pig Board, care of the Department of Agriculture and Stock, Brisbane, until 5 p.m. on 21st November, 1927, for election for one year as growers' representatives on the Northern Pig Board.

Five such representatives are to be elected by those persons, who, at any time since the twenty-second day of June, 1927, kept pigs in any of the Petty Sessions Districts of Atherton, Herberton, Chillagoe, Cairns, Douglas, and Mourilyan.

Each nomination is to be signed by at least ten such growers.

If more than five nominations are received, a postal ballot will be taken.

The election (if any) will be held on the 23rd December, 1927.

Milk as a Food.

Milk is as near a perfect food as it is possible to obtain, as it contains all the essential elements for normal growth and development. We find it contains the materials necessary to maintain the living tissues of the body, i.e., proteins, and enough of the fats, starches, sugars, and mineral substances to furnish energy and growth. Milk contains a substance whose nature is not yet fully understood, but whose presence in the diet has been demonstrated to affect body growth in animal or man to a remarkable degree. These substances are termed vitamines, growth determinants, or the unknown dietary factors.

Clean milk fulfils all of the requirements for an adequate food better than any other single foodstuff, and it is the food most needed on the plantation, and in a great many instances, the hardest to obtain. Infant mortality would be decreased, and a healthier lot of youth would result were more pure, fresh milk used as food, and not considered in the light of a somewhat rare beverage for the older children. Milk as a source of energy, or as fuel for the body, compares most favourably with other foods.

The energy value of a quart of milk is about equivalent to that of a pound of lean meat or of eight eggs. As a source of energy, "cereals"—such as wheat, oats, or barley preparations—are, however, cheaper generally than either milk, meat, or eggs, and therefore cereal and milk is the ideal combination of foods to furnish energy in childhood.

Of all foodstuffs, milk is the cheapest, and most abundant source of obtaining the essentials for bone formation and growth. Therefore, milk should form a large part of every child's diet. How often have we seen ignorant mothers bringing up infants on a diet of coffee or tea, to which was added a small amount of canned milk!

WOULD NOT BE WITHOUT THE JOURNAL.

Thus a Bororen correspondent: " . . . The Journal is a publication I would not be without."

Swat That Fly.

The Dairyman's Pest.—Go into a milking shed on a very hot day in which cows are bailed up for milking, and notice the large number of flies annoying each animal, and see how that animal switches its tail, moves its feet and body in order to "keep the fly moving." If you want contentment and milk something should be done to rid the cows of the fly pest.

Flies are a terrible torment at times and have much to do with the lessening of the milk-flow. The cows are so worried and kept so busy fighting the flies that they lose much of the time they should be feeding, and it is their semi-starved condition that largely causes the shrinkage in flesh and milk.

The following mixture has been found as effective as, and less expensive than, many of the fly remedies on the market:—1 gallon fish or seal oil or old grease of any kind; 1 pint kerosene; 2 ounces (4 tablespoonfuls) crude carbolic acid. Mix well together and apply with a cloth or spray to all parts except the udder. Always put it on after milking to avoid the strong odour getting into the milk. In dry weather one application a week is usually sufficient. If the cows are out in a heavy rain, it will be necessary to go over them again.

Another fly remedy is:—10 parts of lard, or other grease, to 1 pint of pine tar. Mix well and apply with a brush or cloth once or twice a week to the parts most attacked. This is splendid as a relief.

The House Fly.—The house fly has always been a troublesome nuisance, but it is looked upon as a very potent agent in spreading dangerous diseases.

Flies are such indiscriminating scavengers; in their migrations they visit everything both hidden and revealed. When we consider this, the thought of them walking over our food or taking a sail in the milk pitcher is far from pleasant, and when bacteriologists inform us the average fly carries around on its body one and a-quarter million germs, surely we should feel a just cause for alarm.

How they Breed.—Flies breed profusely in filth. They reproduce themselves in counless thousands in the open manure pile, in the dirty pig pen or yard, in places where the household slops are regularly deposited, in vegetable garbage, any place where there is decomposing material.

By storing the manure in a dark shed, or by spreading it on the fields, keeping cow and calf yards and pig yards, &c., as clean as possible, and by providing better sanitary conditions, the troublesome fly can be greatly reduced.

To sprinkle all possible breeding places with kerosene or cover with lime, every few days, is strongly recommended.

Dr. Howard, entomologist of the United States Department of Agriculture, has found that each female lays about 120 eggs, which hatch in eight hours, the larva period lasting five days and the pupa five days, making the total time needed for the development of a generation just ten days. A big fly has always been a big fly, and a little fly can never grow to be a big fly—and just as soon as they have emerged from the pupa stage they begin laying eggs. Under favourable conditions a single pair of flies are capable of breeding something like 74,473,197,060,800,000,000,000 of their kind in a single season. Thanks to the birds and other agencies, flies are kept somewhat in check.

Our Deadly Enemy.—It is almost impossible to keep flies out of the kitchen, milk-room, and cow-stable, but we can greatly lessen their entrance by having the windows and doors screened.

Do not feed the flies by leaving dirty dishes and cans about the premises. Wash the milk-room floor clean.

We must learn to regard them as one of our most deadly enemies.

Electric Lighting on the Farm.

Mr. Walter Tronson, a well-known Pomona dairy farmer, in the course of a very interesting letter to the "Live Stock Bulletin" (1st October), had this to say:—"By the way, I often wonder why more dairymen who run milking machines, and have engines, do not get a dynamo, so that they can have their houses lit with electric light. I have been lighting my place for years, and it never gives any trouble. I was speaking to the manager of a big electric light works the other day, and he said to me that any dairy farmer who had an engine could get a dynamo, all the wiring for seven or eight points, a suitable battery, everything complete, for £50. Why the dickens doesn't every dairyman light his house properly?"

New Zealand to Can Butter.

According to the "Times" Trade and Engineering Supplement (London), a report from its correspondent at Vancouver states that "the unfortunate experience of New Zealand in regard to her price-controlled butter on the London market has apparently led exporting interests in the Dominion to make preparations for canning butter on a larger scale for the world's markets, and orders have just been placed with a company for 1,000,000 cans from the 1 lb. to 20 lb. capacity.

"These cans are to have three different designs, and hues to meet the different colour requirements in South America, the Orient, and the South Sea Islands."

Essentials in Dairying.

There is always a definite starting point in attempting to achieve all things, and in reducing the cost of producing milk and its products the very first move must be that of taking an inventory of the whole situation as it now exists. That is the one way to find out what is wrong, and nothing can be righted until you know wherein it is now wrong.

Here are three fundamental facts (says the "Live Stock Journal") that must be grasped before the situation can be appreciated in the proper light:—

1. The dairy cow is a machine.
2. The dairy farm is a factory.
3. The dairy farmer is a manufacturer.

He who doubts these statements and does not conduct his operations accordingly will fail in ninety-nine cases out of a hundred. His only hope is that of luck.

On the other hand, when one who milks cows gets these three sentences marked indelibly on his mind and implanted in his heart, so that he recognises them as essential, vital facts, he soon realises that there is no business more worthy than dairy farming, no factory where good management is more necesasry than on the farm, and no machine more responsive in converting raw material into finished commodities than are good dairy cows.

The Royal Society of Queensland.

The ordinary monthly meeting was held in the Geology Lecture Theatre on Monday, 26th September, 1927.

The President, Professor E. J. Goddard was in the chair.

Messrs. A. M. Epps and L. Franzen were elected ordinary members of the Society.

Dr. E. O. Marks exhibited waterworn pebbles of igneous rock from the Mesozoic sandstone at Caloundra. Dr. Bryan and Mr. F. Bennett commented on the exhibit.

A paper on "Plants collected in the Mandated Territory of New Guinea by C. E. Lane-Poole," by Messrs. C. T. White and W. D. Francis was communicated by Mr. C. T. White. He laid on the table Mr. Lane-Poole's report on the Forest Resources of the Territories of Papua and New Guinea, published by the Commonwealth Government in 1925, which contained the narrative of the expedition and field notes on the specimens collected. Four species were described as new: *Sarauja emarginata* (Dilleniaceæ), *Eurya albiflora* (Ternstroemaceæ), *Mearnsia cordata* (Myrtaceæ), and *Hoya Poolei* (Asclepiadaceæ); and a number of new records were made of the distribution of known species.

Mr. A. K. Denmead, B.Sc., read a paper entitled "A Survey of the Brisbane Schists." This was an account of his investigations of the basal rocks between Tweed Heads and Rockhampton. He divided the rock formations into four series: (1) The greenstone series, largely in evidence near Petrie and Dayboro'; (2) the Bunya series, of micaphyllites, found in the area between Tweed Heads and Beenleigh, also at Coorparoo; (3) the Neranleigh series of greywackes, slates, &c., between Nerang and Beenleigh, and (4) the Fernvale series of jaspers, limestones, serpentines, &c. The trend of the rocks generally, he said, was from north-north-east to south-south-east. He advanced theories as to earth foldings and faults, and suggested that, in point of age, the lower beds were Silurian, passing through the Silurian into Devonian, and possibly through the Devonian into the Carboniferous. The paper was discussed by Dr. Bryan (who also communicated Professor Richards' comments), Drs. Whitehouse and Marks, Messrs. Tryon, Massey, and Bennett.

Value of Orange Juice.

The great value of orange juice was pointed out in a paper read by Dr. Stanley Willmott at the British Pharmaceutical Conference, which recently sat at Brighton, England. "Of all citrus juices," he said "there is little doubt that that of the orange is the most valuable. It is, perhaps, the only food other than milk that can with safety be given to infants. New experiments have shown that orange juice has a much higher food value, or vitamin content, than was previously ever suspected." The chairman of the conference said the food value of oranges was remarkably high, and the use of pharmacists of the concentrated juice was a matter of importance.

Shade Trees—Their Economic Value.

The treeless farm presents a very sorry spectacle, and one cannot fail to feel pity for the animals that are obliged to stand or lie in the broiling sun because of the absence of shade of any description.

It should be the aim of every farmer to surround his homestead with trees and to establish moderate-sized clumps in all the paddocks. Awkward corners can be utilised in no more profitable and pleasing manner than by planting them with trees.

In districts where timber for fencing and other purposes is scarce, all land that offers any difficulty in carrying on cultural operations should be planted. The investment, provided that the trees are accorded reasonable care and not interfered with by stock, will in the years to come return a very high rate of interest.

Apart from their economic and utilitarian value, trees, when judiciously arranged, add immensely to the attractiveness of a property and render it pleasingly distinctive, so that strangers in the district are immediately impressed.

Dirty Fallows—Work for Summer.

Neglecting the fallow during the months of November and December is the chief cause of dirty fallows, and there is ample evidence that cultivations during those months have a more beneficial effect than in any other month of the fallow period. It is evident, too, that the more frequently the fallow is worked, provided of course it is done in the right manner, the better the chance of maximum yields. No better proof of the correctness of this statement is to be had than the results of the Central Western Championship Wheat Competition of last season, in which the winning crop—it obtained the highest points in all competitions in the State—was cultivated ten times between ploughing and sowing. Working the soil during the hot summer months is, of course, not recommended unless rain has destroyed the mulch, in which case it should be restored.

Perhaps the most frequent cause of harm to fallows is allowing weeds to grow to such a height that the disc-cultivator has to be employed, and to a depth ruinous to the compacted sub-surface soil. It is essential that all weeds should be destroyed when they are very small by shallow cultivation, preferably with the harrows.

The disc cultivator, regarded with such a friendly eye by most wheat-growers, is without doubt the best implement of all to put the fallow in bad condition. While admitting its value in destroying large weeds, it must be admitted that their destruction when small with other implements or sheep is nearly always possible, and that large weeds are the sign of neglected fallows. Deep discing ruins the compacted sub-surface layer, and delivers the clods to the bottom and fine soil to the surface, where it is easily crusted by the first rain. As discing usually takes place after harvest in January or February, not only is the whole physical condition of the fallows practically ruined, but rapid evaporation of moisture results, and there is not sufficient time to restore consolidation unless special means are devised, and they very rarely are.

It is in connection with the keeping down of weeds on the fallow that sheep are so valuable. They should undoubtedly be regarded as essential on every wheat farm; not only are they in themselves a profitable source of revenue, but they are a big factor in the production of an ideal fallow, not only by keeping down weed growth but also in assisting to produce a firm sub-surface area.

THE JOURNAL CONTAINS A WEALTH OF INFORMATION.

A Mulgeldie subscriber writes: "Enclosed please find renewal subscription for the Journal. Many thanks for past copies which have contained a wealth of information for the man on the land."

Production Costs in Terms of Time.

Interesting investigations were recently carried out by the Department of Agriculture, United States of America, with regard to the amount of labour expended in the production of various agricultural products which show that ordinarily tobacco requires more labour per acre than any other major crop grown in the United States. An acre of Burley tobacco yielding from 800 lb. to 1,000 lb. requires for growing, preparing for market, and marketing, from 350 to 400 hours of labour.

Cotton in the eastern cotton States requires from 100 to 125 hours of labour per acre where the yield of lint is from 150 lb. to 200 lb. On the other hand, in the western part of Texas, growers on farms yielding 140 lb. to 160 lb. of cotton per acre will normally expend only thirty-five to forty hours of labour per acre.

In producing an acre of potatoes from sixty-five to 100 hours of labour are normally used.

Labour requirements in corn production vary widely. In the Corn Belt, where large machines are used in large level fields, a bushel of corn can be produced with about 0.5 hour of labour, whereas in certain Southern States about 2.5 hours of labour are required for producing a bushel of corn.

Tobacco, cotton, sugar beets, potatoes, fruit, and truck crops absorb relatively large quantities of labour. Corn, the grain sorghums, and peanuts need less. Hay and small grain crops are usually produced with the least labour.

Agricultural Education in the United States.

According to "The Journal of the Ministry of Agriculture," London, agricultural education in the United States of America during the past thirteen years has made remarkable progress through the development of the extension movement. This development dates from the introduction of the Smith-Lever Act in 1914, the keynote of which is co-operation. Prior to this Act, colleges were conducting considerable extension work with their own funds, and the Federal Department of Agriculture was spending, independently of the colleges, a further sum of 1,000,000 dollars. This work is now carried out by a single division, organised at the college, with a director at its head, appointed by the college with the assent of the Secretary of Agriculture. There is, further, co-operation between colleges in part of the extension work and in the plan for the voluntary pooling of all funds available for the various States.

In 1914 the State and Federal Governments were spending 1,600,000 dollars on extension work in agriculture and home economics, and, by 1924, this figure had increased to 19,394,639 dollars per annum, of which approximately 12,000,000 dollars were contributed by the States and counties.

In the same period, the total personnel increased from 1,230 to 4,764 officers, the latter figure including 765 full-time specialists, extension directors, and other supervisory officers.

In determining the policy of the extension work for a district, the farmers, with the agents of the co-operating county, State and Federal Governments, together review the local conditions and agree upon what ought to be done. The administration of the work is then entrusted to the State College of Agriculture. The full recognition of local people, conditions and practices, and the enlistment of the active participation of the individual farmer and his family in the planning and the carrying out of local extension work, are the two fundamental considerations to which the success is accredited. Demonstration farms, owned and operated by the Government, are being replaced by demonstration units owned and operated by the farmers under schemes developed jointly by the farmers and the Government agents. This partnership of the farmer with the Government, together with his work as a voluntary helper in the capacity of demonstrator, chairman or member of committee, has developed a sense of rural leadership, and given to the farmer a greater breadth of outlook, apart from the more direct benefit which accrues from the opportunity of improving his technical efficiency. The primary object of extension work, however, is the adoption of an improved practice, and there is evidence of a much wider use by farmers of lime, cover crops, green manures, fertilisers, seed of improved and standardised varieties, and of the improvement of orchards by renovation, pruning, and spraying.

Farmers are advised as to the formation of co-operative organisations for the disposal of their products and for the purchasing of their supplies, provided with general information on marketing problems, encouraged to adopt better business principles, and stimulated to keep and utilise farm records as a means of regulating their business.

Concentrates—Price Not Always Index of Value.

In buying concentrates, it should be borne in mind that the market price of any particular feed is no indication of its value to the individual farmer. The value of any feed to the farmer depends largely on the nature and composition of the other feeds which he has at hand.—T. HAMILTON, in the "Rhodesia Agricultural Journal."

Co-operative Development in the United States.

It is estimated that in 1900 there were approximately 2,000 farmers' business organisations functioning in the United States. Between 1900 and 1925 the number of active associations increased to about 12,000, and the purposes for which associations existed also increased.

At the close of 1925 there were approximately 12,000 functioning associations, including 40 federations, 80 centralised associations, 35 sales agencies, 50 bargaining associations, and nearly 10,000 independent local associations.

The number of associations marketing dairy products increased from 1,600 to 2,200; the number of associations handling grain from 100 to 3,400; the number of livestock shipping associations from less than 100 to 1,800; fruit and vegetable marketing associations from 100 to 1,300. There were also formed nearly 100 associations for marketing wool, and 70 marketing poultry and poultry product.

It is reasonable to assume that the business done in 1900 amounted to less than 200,000,000 dollars. This figure is significant in comparison with 2,400,000,000 dollars which is the estimated amount of business by farmers' associations in 1925. The 1900 figure is even more significant in the light of the fact that several of the present-day associations report sales of more than 50,000,000 dollars a year.—"News Bulletin" of the Markets and Migration Department (Federal).

Seeking a Substitute for Petrol.

Speaking at the annual meeting of the Distillers' Company, Limited, in Edinburgh (Scotland) recently, the chairman (Mr. W. H. Ross), referring to the extension of the company's business overseas, said that it was conducting experiments in order to provide an alternative motor fuel. Although it had demonstrated beyond doubt the possibility of providing such a fuel, the company was met with two difficulties—(1) the improved position of petrol supply, which has enabled that commodity to be sold in England at a figure below the present cost of production of an alcohol fuel, and (2) the uncertainty of finding a raw material for producing such a fuel in England at a low enough price. In conjunction with international interests the company was now experimenting with a material that in time might supply the deficiency, but while continuing these experiments the company had also turned its attention to other parts of the Empire where the raw material could be obtained in considerable quantities at the minimum of cost. Such a field had been found in Northern Queensland, where, in conjunction with the local sugar planters and other Australian interests, and supported by the State Government as well as the Commonwealth Parliament, it had erected a moderately-sized distillery, which would be followed by others as soon as the first one had proved a success.

Mr. Ross acknowledged the valuable assistance the company had received at the hands of the Commonwealth and of the State Governments, which should go far to make this new industry a benefit both to Australia and to the company.

An Effective Mouse Poison.

A poison that is proving highly satisfactory to farmers pestered by mice and sparrows is made of wheat coated with strychnine and milk. About 12 lb. of wheat (seconds are quite suitable) is first moistened with milk, and any surplus milk then drained off. One ounce of strychnine is next ground up and dusted on to the moistened wheat, which is mixed up by hand, and finally spread out on a bag to dry.

This poison is very strong, and a mouse has only to eat one grain to be destroyed. Another advantage is that this poisoned wheat may be kept for two years without losing its effectiveness. As soon as any mice are noticed the poison should be spread around and the mice will quickly disappear.

If the majority of farmers would adopt these preventive methods, mouse plagues would be quite unknown. If all haystacks were made mouse-proof with galvanised iron, the breeding grounds would be removed, and this combined with the use of poisoned wheat would stop a mouse plague at its very inception.

Now that farmers in our wheat districts are becoming more progressive and better organised, local bodies such as agricultural societies or branches of the Agricultural Bureau, who take a pride in local improvement, might organise co-operative movements to free their districts from the menace of future mouse plagues.—E. S. CLAYTON, Senior Experimentalist, in "Agricultural Gazette," New South Wales.

Market Good Crops through Good Cows.

The aim of the dairyman should be to market a large portion of the crops grown on his farm through his cows, but it should be borne in mind that the kind of crops grown and the way they are fed has a lot to do with their ultimate value when marketed as dairy products. As far as possible the dairyman should avoid sending good crops to market through poor cows.—T. HAMILTON in the "Rhodesia Agricultural Journal."

An Appeal for Thrift.

The seasons and the prices are not alone to blame for the shortness of money and the failure to make the farm pay. Those who know most about the economic conditions are outspoken in their appeal to farmers to exercise thrift. The same appeal may with equal force be made to all classes. In facing the prospect farmers will have to look more closely into those expenditures which are not necessary and which carry so many others in their train. A short period of intense thrift would be healthy for us all and do the country great service. Such a lessening of expenditures as could easily be made would help many a man to tide over his season and market difficulties. The only alternative is a lengthened procession of failures and a longer period of losses alike to farmers and to traders.—Waimate "Advertiser," (N.Z.).

Encourage Home Manufactures.

If an individual policy is adopted of purchasing goods locally made wherever a choice is possible, the result will be increased confidence on the part of manufacturers, extensions of buildings and plants, the establishment of new industries, and a much larger demand for skilled labour. These, in turn, will add to the man-power of the country, will enlarge our resources, and so make the burden of taxation proportionately lighter. In building up our own national strength we are making our greatest and most valuable contribution to Imperial strength and unity.—Lyttleton "Times" (N.Z.).

Land Values.

It would be the height of absurdity, realising the conditions that make farming unprofitable, to hesitate to adopt those measures which will give the industry a chance to make good. It is essential that confidence be restored, not only amongst farmers, but those who finance the farmers, and this can only be done by ruling definitely that land can have only one value, and that what it is capable of returning from production in average years. There can no longer be a taxing value, and a selling value from 150 to 200 per cent. above that on which taxation is paid. The settler must have his chance, and the system adopted must afford him not only protection against exploitation by speculators, but protection against any inclination on his own part to take serious risks.—"Southland News" (N.Z.).

Do the Job Properly!

Competition from abroad will compel efficiency or drive inefficient industries out of existence. This was shown in a remarkable manner some years ago in the British boot industry, which plodded along in its old-fashioned way until American boots began to invade the British market. The British manufacturers did not, however, wait for a tariff to protect them; they overhauled their industry and made it so much more efficient that in a short time they were able to drive out the invaders and in their turn invade American territory. There are efficient industries which are prospering and not participating in the demand for higher protection, but there are others whose overhead expenses are so heavy that they cannot make a profit.—"Taranaki Herald" (N.Z.).

Our Social Obligations.

"More and more we are realising that property can be justified only when it fulfils a function in society. The fortunate individual who draws huge royalties merely because he is lucky enough to own land which contains wealth; the middleman who produces nothing and who yet takes a big proportion of the profit; the man who lives on dividends and serves the community in no way to make up for the fact that he is not engaged in business: all of these ought to be taxed so heavily in comparison with the rest of the community that they will be tempted to serve a more useful purpose than merely to live upon the work of others."—From "The Permanent Value of the Ten Commandments," by H. J. Flowers, B.A., B.D.

Fodder Sorghum.

After-cultivation and Harvesting of the Crop.—In a recent issue of these notes attention was drawn to the value of the sweet (or fodder) sorghums, particularly to farmers in the drier parts of the State. Coastal dairy farmers have long ago realised the value of sorghum as supplying a highly nutritious and bulky fodder which is relished by all stock.

As particulars regarding sowing, manuring, and varieties were dealt with in the previous article, we will confine ourselves now to a consideration of after-cultivation and harvesting of the crop.

If the crop has been planted on the flat, the spaces between the rows should be lightly worked with a one-horse cultivator when the young plants are from 4 to 6 inches high. If the seed has been planted in furrows the first working of the ground should be carried out, when the young plants are 3 inches high, by lightly harrowing the area in the direction in which the drills run. This work kills a considerable amount of weed growth, and at the same time works some fine soil around the young plants. Another harrowing should be given when the plants reach the top of the drill, in order to finally level off the ground and check weed growth.

Frequent workings with the cultivator are necessary during the growth of the crop to keep down weeds and check evaporation of soil moisture. On large areas, a handy implement to use is a two-horse spring-tooth cultivator; this straddles the rows and covers a lot of ground in a day. This machine can be used until the crop is 3 or 4 feet in height; if subsequent workings are necessary, the single-horse machine has to be resorted to.

Shallow cultivation is necessary, as the sorghum roots come to within 3 or 4 inches of the surface of the ground.

When and How to Harvest.—Sorghum should not be fed to stock until it comes into head; if fed prior to this stage there is a danger of what is commonly known as sorghum poisoning. The greatest yield of green fodder is obtained when the seed has formed and is still in the milky stage; at this stage the material is very palatable and digestible.

Harvesting large areas for silage is generally carried out with a maize binder. This machine deals with a single row of crop at a time, and ties the material into bundles, thus facilitating handling in the field and at the silo chaff-cutter or silo stack. If the sorghum crop is not too high and bulky, and the stalks are fine, a reaper and binder will do effective work.

On small areas the crop is cut with sickles or hoes. A handy implement for cutting maize or sorghum stalks is a sledge with scythe blade attached; it is drawn by a single horse, and will cut a large amount of material in a day.

Sorghum intended for silage should be harvested when the grain is in the dough stage. Like all bulky fodders, it makes the best silage when chaffed, as it then packs well in the silo.

Sorghum Poisoning.—Cases of death have occurred frequently among cattle feeding upon sorghum. The deaths have been attributed by some to the presence of a poisonous substance in the plant, while others hold that they are caused by hoven, and that the crop is not more likely to cause death than any other green food. The suddenness of death, however, among stock after eating only small quantities of the plant is proof that some other factor than hoven is at work.

In feeding sorghum to stock it is only necessary to adopt certain precautions to avoid loss. The poisonous substance gradually diminishes as the plants get old, and entirely disappears by the time the seed is formed. Stock should not be allowed to eat young sorghum, especially if it is wilted through dry, hot weather. Stunted sorghum may also cause death, and immature sorghum which has been frosted is dangerous. The mature sorghum is harmless, and can be fed with perfect safety.—"A. and P. Notes," N.S.W. Dept. Agr.

PLEASED WITH THE JOURNAL.

A Warwick subscriber writes: "I received a copy of the 'Agricultural Journal,' also leaflets on poultry. I am very pleased with the valuable information on different subjects. I am enclosing order form for the Journal, which I consider no farmer should be without . . . ."

Beekeeping as a Farm Side Line.

Following are points of a paper on beekeeping on the farm read by a local farmer, Mr. A. J. Gregory, at a recent meeting of the Port Elliot branch of the South Australian Agricultural Bureau:—

Mr. A. J. Gregory said any farmer with a little knowledge of the subject could keep a few hives of bees without neglecting the more important work of the farm. To manage bees one required confidence, because the bees would detect nervousness, and drive the apiarist away every time he approached them. Bees should not be handled roughly, because that annoyed them. A smoker was the best thing to keep them in check. One should not go to the hive and puff smoke straight into the entrance; that had a tendency to drive the bees into the top part of the hive, and when the cover was removed one would find too many bees to drive down again, and they would become troublesome. The correct procedure was to go quietly to the hive, puff some smoke across the entrance once or twice, raise the cover sufficiently to puff some smoke across the top of the combs, put the cover down again for a few seconds, and then remove the cover. The smoke should be kept going across the top of the comb until the bees were all driven down, and then the combs should be removed for inspection. Those which were full of honey or contained sealed broods and honey should be extracted. On no account should unsealed ones be put through the extractor, or the hive of bees would be weakened, and if the honey flow continued would mean a loss, because hives which were not full of workers would not produce much honey. With regard to the position for standing hives, one should select a well-sheltered position, preferably facing an eastern slope. The hives should be placed at least 10 feet to 12 feet apart, with the entrance towards the east. They should not be placed too close to the homestead or a thoroughfare, or any part where other work had to be done, or trouble could be expected from the bees. Hives could be bought flat or intact, as well as frames, from any firm which stocked appliances. It was cheaper to buy the hives flat, so that they could be easily nailed together. Frames should be put together neatly, and fine wire used to hold the combs together. To fasten the foundation combs in the frames, one should cut a piece of board to fit inside the frame, place the foundation comb on the board, put the frame over that and press the wires into the comb, and fasten to the top of the frame with melted wax. In rearing queens, they should be selected from the best honey gatherers, and never from a poor gatherer. Drones also should not be reared in any but a hive of good gatherers. A few drone combs should be placed in the centre of the hive during the early spring. Speaking of methods of increase, the writer said if one had not time to watch the hives when swarming during spring time, the number of swarms could be increased by pasting them up, providing they were in double hives, and strong enough to make into fair swarms. One should remove the cover, and give the bees a thorough smoking, so that the queen and most of the bees were driven down to the lower part of the hive. The top part should then be removed and placed on a bottom board, a cover put on each, and the bottom part removed to another part of the apiary, leaving the top part in its original place. Both parts should be inspected after about five days in order to ascertain the swarm with the queen. If she had been left in the top part the places should be changed again, or most of the bees would return to the old position after a few days. After eight days the hives should be inspected in order to see which hive had no queen, and then all the queen cells except one should be removed. Only one queen cell should be left. If more than one was left the bees would swarm as soon as one queen was hatched. They should be allowed to swarm naturally and if one had the time it was best to hive them. In any case, if possible, they should not be permitted to send out more than one swarm each. The old hive should be examined five or six days after the swarm had left, and all the queen cells except one removed; otherwise they would have too many young queens ready to send off other swarms. That was the time to select queens from the best honey gatherers. The queen cell should be placed into a hive which was not producing good supplies of honey, and, at the same time, all the queen cells from the poor hives should be removed and destroyed. If the hives were not very strong, or there was not sufficient working bees available when good honey flowers were about or coming on, a good plan was to put a weaker hive alongside of them for a few days, and then move them to another part of the apiary. Similarly, if one had too many bees or too strong, they should be changed with a weaker one. That should only be done when good honey flower was in bloom. The writer concluded by saying that quality was more to be desired than quantity: thirty well-cared-for and well-worked hives of bees would gather as much honey, or perhaps more, than 100 hives in a weak state and badly managed.

Varieties for Cross-Pollination.

Varieties planted for cross-pollination must have an affinity for each other; that is, the pollen of one must be acceptable to the pistils of the other, and such as will give the heaviest yields of good fruit. Both must be good pollen producers. If one is a shy bearer, and the other blooms in abundance, the variety producing little pollen will, of course, be greatly benefited, but there will be little reciprocal action.—J. M. WARD, in the "Journal of Agriculture" of Victoria.

The Reserve Power of the Horse.

Horses have the advantage of being immediately adaptable to all conditions; they can be used on wet, soft, and boggy country, and then proceed along a macadamised road. The flexibility of the horse is marvellous, and in this he has a distinct advantage over the motor. For short distances the horse can develop a power several times as great as its normal working power. For this reason he can pull through clay bogs, climb steep hills, and successfully deal with all sorts of emergencies. On the farm the horse looks after its own repairs and renewals—the cost of which to the owner is infinitesimal.—J. F. MCEACHRAN, M.R.C.V.S., in "Agricultural Gazette," N.S.W.

The Constitution of the Dairy Cow.

To stand up to the strain of heavy dairy production a strong, robust constitution is one of the essentials needed. Much of the dairy cow's time in daylight when she might otherwise be feeding is taken up in and about the bails or yards and travelling backwards and forwards to the pastures, and as compared with fattening stock she is under a big disadvantage in this respect. Then, again, when in times of severe drought the feed is dried off by the great heat and practically disappears, the heavy-milking cow will, for a time, draw on her reserve forces to supply milk, to the certain detriment of her constitution.—J. T. COLE, at a recent Animal Husbandry Conference (N.S.W.).

Practical Co-operation.

Batlow (New South Wales) fruitgrowers commenced co-operative operations in 1923 by establishing cool stores with 8,000-case space capacity. In 1924 they increased their stores to 14,000 cases, and, in addition, formed a co-operative packing-house company, and provided and operated the most up-to-date and efficient packing conveniences and plant. In 1926 the success of the existing cool stores demanded increased accommodation, and the stores were again enlarged to provide 24,000-case space. Not satisfied with trebling their undertaking in the first four years of their operations, the society is at present engaged in duplicating their stores, and will have from 45,000 to 50,000-case space available to handle the 1928 apple and pear harvest. As the stores are filled twice in the normal year, Batlow will be able to store upwards of 100,000 cases next harvest.

The cool stores and packing-house have enabled the growers to exercise a control over their marketing, and in this connection their Sydney selling depôt and their direct country sales have been mutually beneficial to the producer and the consumer.

There are only thirty-six members of the cool stores and twenty-four of the packing-shed. The capital costs are: Cool stores, £14,000; packing-shed, £3,500, making a total capital outlay of £17,500, of which £11,705 has now been actually provided by the growers. Of this £11,705, calls on shares have provided £5,785, and retention and loan levies £5,920. To provide for the 1927-28 extension of the cool stores, this latter sum is being capitalised in the form of shares paid up to 5s., which are being issued to existing shareholders in proportion to their individual retention and loan levy credits. It is of interest to note that the loan levies—which in the case of the packing-house amount to 3d. per packed bushel case on all fruit handled for shareholders, and with the cool stores to 6d. per case space per annum—both charges representing comparatively small deductions—have provided the means whereby the latest extension work is being financed.

The new work is estimated to cost £11,500, the whole of which amount will be advanced by the Rural Bank, the company having made arrangements by a system of case-levy to repay the whole within ten years. It is interesting to realise that the capital expenditure for the thirty-six people involved is £29,000, and that they are prepared, in view of their experience, to go on and on with the steps that will give them what all secondary producers require to get—the control of their produce.—C. C. CRANE, Agricultural Bureau Organiser, in "Agricultural Gazette," New South Wales.

Improvement of Dairy Cattle in Irish Free State.

According to the Department of Agriculture there has been a most gratifying expansion of the measures for the improvement of dairy cattle in the Irish Free State. The number of Cow Testing Associations has been increased from 154 to 208, and the number of cows under test from 26,000 to nearly 54,000. It is estimated that approximately 230 associations will be recognised for the year 1927, representing an increase of over 42 per cent., as compared with 1923. Coincident with this progress in the grading up of non-pedigree dairy cattle there has been a correspondingly satisfactory increase in the number of pedigree dairy cows brought under test and in the number of new pedigree herds established. The latter developments have been largely assisted by the provision by the Department of an increased number of high-class stock bulls at approximately half cost for the use Cow Testing Associations, and by the leasing of such animals at a nominal fee to owners of small pedigree herds, who would not otherwise be in a position to purchase suitable animals for service purposes.

Silage as an Insurance.

Under the triple heading—"More about Ensilage—A Great Insurance Policy—Costs 3s. 6d. per ton, now worth £5"—the "Quirindi Advocate" (N.S.W.) published a letter dated 19th July, 1927, from Mr. Tom Scott, of Scott Brothers "Aberfeldie," Currabubula, from which we extract the following:—

"As you know, we had a wonderful winter last year, and all sorts of rubbish grew in abundance. We had an old cultivation paddock, which grew a wonderful crop of wild oats, being in places 6 feet high. This we decided to put into pits as the only way of getting rid of them. It seemed a big undertaking to handle 400 tons of green stuff, but it turned out much easier than we expected. The first thing we did was to get in touch with Mr. M. H. Reynolds, who came along and gave all the necessary information on ensilage making, and watched it right through. The cost was an eye-epener to me. I expected it to be big, but on working it out I was surprised to find that 3s. 6d. per ton covered it—digging the pits included. To-day its value is about £5 per ton. We have been feeding sheep, cattle, and horses on it for about six weeks, and they seem to be doing all right. The cows are milking well, lambing ewes are in good order, and the lambs are good."

Green Feed Values.

Fresh green roughages and succulents in general have a low protein content, owing chiefly to the relatively large amounts of water they contain. It should be remembered, however, that succulent feeds have a value not indicated by chemical analysis. These feeds are palatable, laxative, easily digested, and stimulate milk production.—T. HAMILTON, in the "Rhodesia Agricultural Journal."

Marketing School for Farmers.

A school and institute of co-operative marketing, under the sponsorship of the Connecticut Agricultural College, the Department of Agriculture, and the co-operative associations of Connecticut, was held at Storrs, Connecticut, 16th to 19th August, the Department of Agriculture of United States of America has just announced. The purposes of the Institute, the Department says, in a written statement, are—"First, to make it possible for the men who now bear the responsibility for control and guidance of co-operative marketing in the various localities of New England to profit by each other's experience and methods and to study co-operation under the instruction of men of national reputation in the field; second, to bring some of the most promising and able of the younger farmers of New England into contact with these teachers and with the present leaders of co-operation in order that they may be prepared to take up the burden of responsibility when their time comes."

"VERY MUCH APPRECIATED."

Thus a Collinsville farmer, when writing to renew his subscription to the Journal: "The information in this Journal is quite inviting and very much appreciated."

The Home and the Garden.

THE COOKING OF MEATS.

Miss M. A. WYLIE, Inspectress and Organiser Domestic Science, Education Department, Western Australia.*

FRYING.

A large variety of dishes may be cooked by frying, and, when well done, this is a very satisfactory means of cooking small pieces of meat, fish, batters, and potatoes. When speed is necessary, it is a convenient method, as by it the fibre of food is quickly softened and cooked. A knowledge of a few scientific facts, however, is essential to success. Unless this knowledge is put into practice, failure is inevitable and an indigestible product results.

Frying is boiling in hot fat. Fat is formed of fatty acids and glycerine, the acids varying in the different fats and oils, e.g., the acid of tallow is stearic acid, that of olive and other oils is oleic acid. A simple classification of fats is as follows:—Animal fats: tallow, lard, suet; vegetable fats: olive oil, palm and cocoanut oil, and linseed oil; fish oils. For frying, the fat should be clarified, that is, it should be sweet, clean, fresh, and free from salt. If stale, the acid predominates, making it rancid, though the staleness is only due to foreign matter. Salt fat, when used, prevents proper browning. Dripping, skimmings from stock, oil, lard or butter may be rendered fit for cooking. Lard does not give as good a result as beef or mutton dripping, as it so often leaves a coating of fat on the surface of the food. When butter is used, a slow fire is necessary, as it is a substance that heats and burns quickly. Very often, olive oil is used, as many consider it the best of fats for frying. It, also, heats rapidly and therefore requires a slow fire.

Common fats remain solid at the ordinary temperature of air, but melt at about 160 deg. Fahr., and boil at 350 deg. to 450 deg. Fahr. When boiling, fat ceases to sizzle and bubble, becoming still with a slight blue fume—not smoke—rising from it. It is the presence of water in fat which causes the bubbling. Water boils at 212 deg. Fahr. . . . Therefore when the bubbles occur it is merely the water content boiling. When this is evaporated the temperature of the fat rises to its boiling point (350 deg. to 450 deg. Fahr.).

There are two methods of frying: shallow (often called English frying), and deep, or French frying. Chops, steak, pancakes, liver, eggs, and omelettes may be cooked by the first method; rissoles, fishcakes, doughnuts, potato chips, fish, apple fritters and similar dishes require the second method.

General Directions for Shallow Frying.

1. Place in pan sufficient fat to keep substance from adhering.
2. Heat fat till blue fume rises and surface is still.
3. Lightly and quickly brown substance evenly on both sides (e.g., chops and steaks) to harden surface albumen and so prevent escape of juices.
4. Then cook slowly ten to twelve minutes, turning with a knife.
5. Serve very hot.

Deep Frying—General Directions.

1. Prepare saucepan half full of fat (1 to 2 lb.), or enough to cover substance to be fried.
2. Heat till blue fume rises and surface is still.
3. Immerse substance, lowering it gently into the fat.
4. Cook till a golden brown; generally requires 3 to 5 minutes.
5. Drain on crumpled kitchen paper.
6. Serve on paper d'oyley on hot dish. Garnish neatly.
7. Remove fat from fire immediately, strain to be ready for further use.

Food cooked in this way should be protected by means of a covering of egg and bread crumbs, flour, batter, or oatmeal.

Of the two methods, deep frying is easily the more economical, since, though it requires more fat at the time, this can be strained and used again and again. As well, time is saved, as most foods only take three or four minutes to cook thoroughly when treated in this way.

In yet another way deep frying has the advantage over shallow, for, in this latter method, the large amount of water which is contained in the food quickly reduces the temperature of the small amount of fat, causing a semi-steaming and

* In the "Journal of Agriculture," Western Australia.

boiling process to ensue. Thus the fat is liable to penetrate the food and form a coating round each fibre, rendering it difficult of digestion; whereas in deep frying the fat, by retaining its temperature (since the water in the food does not so materially affect the larger amount of fat), gives crispness to the productive covering which prevents penetration into the food by the fat.

Recipes—Shallow Frying.

Liver and Bacon.

1 liver (calf's, lamb's, sheep or ox liver).
¼ to ½ lb. of fat bacon rashers.
1 tablespoonful of flour.
Pepper, salt, dripping.

1. Cut liver into neat pieces, ½ in. thick.
2. Dip each piece into seasoned flour. This will help to keep in the red juices and prevent the fat from penetrating.
3. Cover bottom of frying pan with dripping (about ¼ in. in depth when melted). Bring to boiling (fuming) point, then put in each piece of liver.
4. Fry 5 minutes on one side and 4 on the other.
5. Place in centre of a hot dish and serve with brown gravy and grilled or fried rolls of bacon. Garnish with finely chopped parsley.

Note.—Cut bacon in thin slices, remove rind. Roll up lightly and thread each roll on a skewer. This may be grilled over the fire or cooked in the oven while the liver is being fried.

Fried Cutlets.

Cutlets.
1 egg.
8 tablespoons bread crumbs.
½ teaspoon salt. Pepper.
Dripping.

Method.

1. Trim cutlets, removing skin and gristle. Leave about 2 in. bare bone.
2. Beat egg on plate. Season.
3. Place bread crumbs on kitchen paper.
4. Dip cutlets into eggs and crumbs. Press each cutlet firmly with a knife and shake off loose crumbs.
5. Melt fat in pan and, when fuming hot, put in cutlets. Fry about 10 minutes.
6. Drain cutlets on kitchen paper.
7. Serve on mound or wall of mashed potatoes on hot dish with tomato sauce.

Recipes—Deep Frying.

Fish Cakes.

½ lb. of cold scraps of fish or tin of salmon.
¼ lb. to ½ lb. of cooked potatoes.
1 egg. Bread crumbs.
1 teaspoon chopped parsley.
Salt and pepper.
2 tablespoons of milk or liquor from the fish.
Dripping. Flour.

Method.

1. Remove bones and break fish up finely.
2. Mash and warm potatoes. Add to fish with parsley, pepper, salt. Mix well.
3. Beat egg. Add milk if necessary. Use part of this or liquor from fish to bind the mixture.
4. Divide into even pieces. Mould into shape, using very little flour.
5. Dip in egg and bread crumbs.
6. Fry in deep fat. Drain.
7. Serve on paper d'oyley. Garnish with lemon and parsley.

THE KING'S "PLUM DUFF"—AN EMPIRE CHRISTMAS PUDDING.

The King's chef, Mr. Cédard, has supplied the Empire Marketing Board, so the Secretary of the Board (Mr. S. G. Tallents) informs us, with the following recipe for an Empire Christmas pudding:—

5 lb. of currants
5 lb. of sultanas
5 lb. of stoned raisins
1½ lb. of minced apple
5 lb. of bread crumbs
5 lb. of beef suet
2 lb. of cut candied peel
2½ lb. of flour
2½ lb. of sugar.
20 eggs
2 oz. ground cinnamon
1½ oz. ground cloves
1½ oz. ground nutmegs
1 teaspoonful pudding spice
1 gill brandy
2 gills rum
2 quarts old beer

For the ordinary family, quantities would, of course, be proportionately less. It is significant that all the ingredients are produced within the Empire and Australian fruits and other products will be used by the King's cook in the Christmas pudding for their Majesties' own table.

MANURING ROSES.

"I never put manure near a rose stalk. I make holes between (half way) the trees, about 12 to 18 in. deep, and the watering once a week is sufficient to carry the good of the manure which is buried in these holes to the trees."—E.F.B. in "South African Gardening."

BONEMEAL FOR THE LAWN.

"As the lawn is generally visible from the house windows, surface dressing in the spring is often neglected on account of the unsightly appearance that is almost unavoidable. Try dressing with bone meal, using 4 oz. to the square yard. It will greatly help in producing a deep green velvety lawn, without being noticeable when applied."—M.B. in "Popular Gardening."

THE MANURE HEAP.

Where farmyard manure has to be stored for a time, it should be carefully kept, in order to conserve the rich ingredients and prevent their draining away. The shape of the heap, of course, depends on the amount and the available space; any shape does, as long as something is placed on top to keep off heavy rains. Stack the manure on the north side of the garden, or at least shaded from too hot sunshine. See that the soil underneath is tramped or rolled firm, and when building the manure on this, spread it out evenly, mix it well, and beat it down firmly. If during the season it appears to get very dry, sprinkle a little water on it to keep it moist. A tub or barrel should be buried near the manure heap, and in such a place that all the liquid flows into it. Every manure heap slowly "sweats" or exudes a brown liquid, which is a very rich fertiliser, and should always be saved. When diluted, this liquid can be used freely.

HOUSE ASHES.

House ashes or cinders should be saved and utilised in the garden. Where the garden is heavy or clayey, they can be spread on the surface and dug into the soil; they will then assist the process of disintegration, opening up the clay and helping at the same time to aerate and drain the ground. Fine, gritty house ashes spread round young plants will keep off slugs and prevent them from doing damage. The fine, dusty matter from the fire may be mixed with soot and used to dust the plants for insecticidal purposes. The large cinders should be used in the boiler fire. When planting bushes of any kind in the garden, mix a little lime with the larger cinders and place a good layer of these in the bottom of the trench. This facilitates drainage, preventing water from stagnating round the roots, and helps to keep pests from burrowing up amongst the roots of the bush. Clinkers, unless of the very finest, should not be used in the garden. The manurial value of cinder is practically nil.

THE CULTIVATION OF THE GERBERA.

Gerberas seem to like a moderately heavy soil best. Red volcanic soils suit them to perfection.

Good drainage is very important. A northerly slope is the ideal spot, open to all the sunlight, for Gerberas are true sun-worshippers. If you have not a northerly aspect, plant the Gerberas along the northern side of a paling fence or wall.

Thoroughly dig the soil to a depth of 18 inches; mix with it some well-decayed cow or horse manure, burnt grass or other vegetable matter; raise the beds slightly, say three or four inches, above the level of the path; tread down the soil firmly, and place your plants in position.

Narrow beds, with two rows of plants placed about 15 to 18 inches apart, will do nicely. After putting out your plants, just keep the soil moist; do not attempt to overdo the watering. Then, beyond pulling out the weeds, leave your plants almost entirely alone.

Purchase the best plants you can obtain. Seedlings, of course, have all their life before them, but you never know what colours you are likely to get. If they are small plants, they may turn out nearly all pale yellows or washy shades. Sections of vigorous plants which have flowered will give entire satisfaction if properly handled.

Do not forget to make the soil firm around the plants. Mulch the surface with rotted leaves or grass. You will then reap a harvest of beautiful flowers, which are not excelled for decorations, over a period of many months.

KITCHEN GARDEN.

Gather cucumbers, melons, vegetable marrows, and French beans as soon as they are fit for use. Even if they are not required, still they should be gathered; otherwise the plants will leave off bearing. Seeds of all these may be sown for a succession. Tomatoes should be in full bearing, and the plants should be securely trained on trellises or stakes. Where there is an unlimited supply of water, and where shade can be provided, lettuce and other salad plants may still be sown. All vacant ground should be well manured and dug two spits deep. Manure and dig as the crops come off, and the land will be ready for use after the first shower.

FLOWER GARDEN.

Keep the surface of the land well stirred. Do not always stir to the same depth, otherwise you are liable to form a "hard pan," or caked layer beneath the loose soil. Alternate light with deep hoeings. A few annuals may still be planted, such as balsams, calendulas, cosmos, coreopsis, marigold, nasturtium, portulacca, zinnia, and cockscomb. Plant out whatever amaranthus may be ready. These may still be sown in boxes. Clear away all annuals which have done flowering. Bulbs should have all the dead leaves cut away, but the green leaves should not be touched. Stake chrysanthemums, and, as the flower buds develop, give them weak liquid manure. Coleus may now be planted and propagated from cuttings. Dahlias are in various stages, but the greater part will have been planted by this time. Give them liquid manure, and never let them dry up. Lift narcissus about the end of the year, but do not store them. Plant them out at once in their new positions. Topdress all lawns.

Orchard Notes for December.

THE COASTAL DISTRICTS.

The planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young they take a long time to pull up and the fruiting period is considerably retarded. Small areas well worked are more profitable than large areas indifferently looked after, as the fruit they produce is of very much better quality. This is a very important matter in the case of both of these fruits, as with the great increase in the area under crop there is not likely to be a profitable market for inferior fruit. Canners only want first-class pines of a size that will fill a can, and cannot utilise small or inferior fruit, except in very limited quantities, and even then at a very low price. Small, badly filled bananas are always hard to quit, and with a well-supplied market they become unsaleable. Pineapple growers, especially those who have a quantity of the Ripley Queen variety, are warned that the sending of very immature fruit to the Southern markets is most unwise, as there is no surer way of spoiling the market for the main crop. Immature pineapples are not fit for human consumption, and should be condemned by the health authorities of the States to which they are sent.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying or cyaniding for scale insects should be carried out where necessary. Spraying with fungicides should be done where the trees show the need of it. A close lookout must be kept for the first indications of "maori," and as soon as it is discovered the trees should either be dusted with dry sulphur or sprayed with the lime-sulphur, potassium, or sodium sulphide washes. Borer should be looked for and destroyed whenever seen.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to quit.

Peaches, plums, papaws, and melons will be in season during the month. See that they are properly handled. Look out for fruit fly in all early ripening stone fruit, and see that none is left to lie under the trees to rot and thus breed a big crop of flies to destroy the mango crop when it ripens.

Keep leaf-eating insects of all kinds in check by spraying the plants on which they feed with arsenate of lead.

Look out for Irish blight in potatoes and tomatoes, and mildew on melons and kindred plants. Use Bordeaux or Burgundy mixture for the former, and finely ground sulphur or a sulphide spray for the latter.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

Early ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle, as the old saw, "Early ripe, early rotten," applies to all of them; in fact, the season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. The available markets are quickly over-supplied with this class of fruit, and a glut takes place in consequence. Merchants frequently make the serious mistake of trying to hold such fruits, in the hope of the market improving, with the result that, instead of improving, the market frequently becomes more and more congested, and held-over lines have to be sent to the tip. There is only one way to deal with this class of fruit, and that is to clear the markets daily, no matter what the price, and get it distributed and into consumption as rapidly as possible by means of barrowmen and hawkers. Most early ripening fruits are useless for preserving in any way, their only value being what they will bring for consumption whilst fresh. This being so, it is only a waste of time and money to forward immature, undersized, and inferior fruit to market, as it is not wanted, and there is

no sale for it. It should never have been grown, as it is frequently only an expense to the producer, besides which, unless the fallen or over-ripe fruit is regularly and systematically gathered and destroyed in the orchard, it becomes a breeding ground for fruit fly and codlin moth, as well as of fungi, such as those producing the brown and ripe rots. Early ripening fruits should, therefore, be carefully graded for size and quality, handled, and packed with great care, and nothing but choice fruit sent to market. If this is done, a good price will be secured, but if the whole crop—good, bad, and indifferent—is rushed on to the local markets, a serious congestion is bound to take place and large quantities will go to waste.

Orchards and vineyards must be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture neessary for the development of the later ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codlin moth and fruit fly must receive constant attention and be kept under control, otherwise the later-ripening fruits are likely to suffer severely from the depredations of these serious pests.

Grape vines must be carefully attended to and sprayed where necessary for black spot or downy mildew, or sulphured for oidium. Where brown rot makes its appearance, spraying with the potassium or sodium sulphide washes should be carried out. Leaf-eating insects of all kinds can be kept in check by spraying with arsenate of lead.

Vegetables will require constant attention in the Granite Belt area. Tomatoes and potatoes will require to be carefully watched in order to prevent loss from Irish blight, and no time should be lost in spraying these crops should this disease make its appearance in any part of the district, as it can be prevented by spraying with either Bordeaux or Burgundy mixture. These fungicides effectually protect the plants to which they are applied if used in time. If leaf-eating insects, such as beetles, grasshoppers, and caterpillars, are doing damage as well, add 3 or 4 lb. of arsenate of lead to the 100 gallons of spraying mixture used for the prevention of early and late blight (potato macrosporium and Irish blight), so that the one application will be effectual for both classes of diseases.

Keep all kinds of vegetables well worked, stirring the land frequently to retain moisture, and taking care to prevent the formation of a surface crust should rain fall. Remember that vegetables require plenty of moisture; therefore leave nothing to chance, but do your best to retain all the moisture in the soil you possibly can.

Farm Notes for December.

Although November is regarded generally as the best period for planting the main maize crop, on account of the tasseling period harmonising later on with the summer rains, December planting may be carried out in districts where early frosts are not prevalent, provided a known quick maturing variety of maize is sown.

To ensure a supply of late autumn and winter feed, dairymen are advised to make successive sowings of maize and sorghums, to be ultimately used either as green feed or in the form of silage. The necessity for such provision cannot be too strongly urged. Farmers who have not had any experience in building an ensilage stack can rest assured that, if they produce a crop for this purpose, information and instruction on the matter will be given on application to the Under Secretary for Agriculture and Stock; also that, whenever possible, the services of an instructor will be made available for carrying out a demonstration in ensilage-making for the benefit of the farmer concerned and his immediate neighbours.

In districts and localities where supplies of lucerne are not available, sowings of cowpeas should be made, particularly by dairymen, as the lack of protein-yielding foods for milch cows is a common cause of diminished milk supplies and of unthriftiness of animals in dairy herds. Cowpeas and lucerne can be depended upon to supply the deficiency. The former crop is hardy and drought-resisting. When plants are to be used as fodder, it is customary to commence to feed them to stock when the pods have formed. Animals are not fond of cowpeas in a fresh, green state, consequently the plants should be cut a day or two before use. Economy is effected by chaffing beforehand, but the plants can also be fed whole. Chaffed in the manner

indicated, and fed in conjunction with green maize, or sorghum, when in head, in the proportion of one-third of the former to two-thirds of the latter, a well-balanced ration is obtainable. Animals with access to grass land will consume from 40 to 50 lb. per head per day; a good increase in the milk flow is promoted by this succulent diet. The plant has other excellent attributes as a soil renovator. Pig-raisers will find it invaluable also.

A great variety of quick-growing catch crops, suitable for green fodder and ensilage purposes, may also be sown this month, notably Sudan grass, white panicum, giant panicum (liberty millet), Japanese millet, red and white French millet. Well prepared land, however, is required for crops of this description, which make their growth within a very limited period of time. French millet is particularly valuable as a birdseed crop, the white variety being more in favour for this purpose.

Successive sowings may be made of pumpkins, melons, and plants of this description.

In districts where onions are grown, these will now be ready for harvesting. If attention is given, in the case of garden plots, to bending over the tops of the onions, maturity of the crop is hastened. Evidence will be shown of the natural ripening-off process, and steps should be taken to lift the bulbs and to place them in windows until the tops are dry enough to twist off. If a ready market is not available, and it is decided to hold over the onions for a time, special care should be taken in handling. Storage in racks in a cool barn is necessary; otherwise considerable deterioration is to be expected. Improved prices are to be looked for in marketing by grading and classifying produce of this description.

Cotton areas which were subjected to a thorough initial preparation, thereby conserving a sufficiency of moisture for the young plants, should now be making good headway and sending their taproots well down. Keep down all weed growth by scarifying as long as the growth will admit of horse work.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

1927.	November.		December.		MOONRISE. Nov.	Dec.
Date.	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5.3	6.9	4.50	6.32	9.41	10.31
2	5.2	6.10	4.50	6.32	10.37	11.34
					p.m.	p.m.
3	5.1	6.11	4.50	6.33	11.37	12.35
					p.m.	
4	5.0	6.11	4.50	6.34	12.42	1.39
5	5.0	6.12	4.50	6.35	1.44	2.42
6	4.59	6.13	4.50	6.35	2.49	3.49
7	4.58	6.13	4.50	6.36	3.56	4.56
8	4.57	6.14	4.50	6.37	5.3	6.6
9	4.57	6.15	4.50	6.37	6.12	7.15
10	4.56	6.15	4.51	6.38	7.22	8.19
11	4.56	6.16	4.51	6.39	8.32	9.16
12	4.55	6.17	4.51	6.40	9.36	10.8
13	4.55	6.18	4.51	6.40	10.36	10.52
14	4.54	6.18	4.52	6.41	11.30	11.30
15	4.54	6.19	4.52	6.41	...	...
					a.m.	a.m.
16	4.53	6.20	4.52	6.42	12.17	12.4
17	4.53	6.21	4.52	6.43	12.55	12.35
18	4.53	6.21	4.53	6.43	1.30	1.3
19	4.52	6.22	4.53	6.44	2.3	1.33
20	4.52	6.23	4.54	6.44	2.33	2.3
21	4.51	6.24	4.54	6.45	3.2	2.36
22	4.51	6.25	4.55	6.46	3.32	3.13
23	4.51	6.26	4.55	6.46	4.3	3.52
24	4.51	6.27	4.56	6.47	4.36	4.39
25	4.51	6.28	4.56	6.47	5.14	5.30
26	4.50	6.29	4.57	6.47	5.56	6.25
27	4.50	6.29	4.57	6.48	6.44	7.24
28	4.50	6.30	4.58	6.48	7.36	8.25
29	4.50	6.31	4.59	6.48	8.32	9.27
30	4.50	6.31	5.0	6.49	9.30	10.28
31	...	...	5.0	6.49	...	11.30

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S., add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

Phases of the Moon, Occultations, &c.

The times stated are for Queensland, New South Wales, Victoria, and Tasmania.

3 Nov.	(	First Quarter	1 16 a.m.
9 „	○	Full Moon	4 36 p.m.
16 „	)	Last Quarter	3 28 p.m.
24 „	●	New Moon	8 9 p.m.

Perigee 9th November, at 1 18 a.m.
Apogee 21st November, at 4 54 p.m.

On the 3rd the occultation of Kappa Capricorni by the Moon will occur about 9.45 p.m at Rockhampton and somewhat earlier at more northern places in Queensland.

It will be interesting to notice the nearness of Jupiter and the Moon late at night on the 5th, especially near the time of the Moon's setting.

Between 10.30 p.m. and 11 p.m. on the 10th Omega Tauri will be occulted by the Moon.

The inferior conjunction of Mercury with the Sun on the 10th will be of special interest on this occasion as the planet will make a transit of the Sun's face.

On the morning of the 21st, Venus will be at its greatest altitude above the eastern horizon, and at about 3 a.m. the crescent Moon, with its horns towards it, will help to form a pretty spectacle

On the 25th, Mercury will be at its greatest western elongation and its greatest height above the eastern horizon before sunrise.

The Southern Cross will reach its lowest point, represented by VI. on the clock face, in its circle round the celestial pole before midnight during November, and will therefore be absent from the evening sky.

2 Dec.	(	First Quarter	12 14 p.m.
9 „	○	Full Moon	3 32 a.m.
16 „	)	Last Quarter	10 3 a.m.
24 „	●	New Moon	2 13 p.m.
31 „	(	First Quarter	9 22 p.m.

Perigee 7th December, at 7 11 a.m.
Apogee 19th December, at 8 24 a.m.

The occultation of Psi Aquarii by the Moon will commence shortly before it rises on the 2nd, but its reappearance on the illuminated side of the Moon may be watched with telescope or binoculars at places as far east as Warwick, Toowoomba, Brisbane, &c., between 12.15 p.m. and 12.25 p.m.

Saturn will be in conjunction with the Sun on the 3rd, when it will be about 900 million of miles beyond the Sun and so nearly on a line with it as to be invisible. A week or two later it will be coming into view in the early morning, with some of the stars of Scorpio, about an hour before sunrise.

A total eclipse of the Moon will take place after midnight of the 8th December. It will first be observable about nine minutes to 2 a.m. on the 9th, when the Moon has passed the meridian and is descending towards the west. Totality will last from 2.54 a.m. to 4.14 a.m., but another hour will elapse before the Moon entirely emerges from the shadow of the earth, so that it will set while partially eclipsed at places on the eastern side of Australia after the Sun has risen.